Curtin Business School
School of Marketing

Enhancing the Sustainable Livelihood of Crab Fishers: A Study of the Mud Crab Value Chain of Coastal Bangladesh Using the Social Business Model

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Doctor of Philosophy
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Declaration

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgement has been made.

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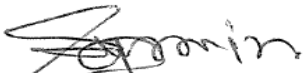
Signature: 

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List of Abbreviations

β	Path coefficient
α	Cronbach's alpha
ATC	Attitude towards a cooperative
AVE	Average variance extracted
B2B	Business-to-business
BAS	Bureau of Agriculture Statistics (the Philippines)
BDT	Bangladesh taka (Bangladesh currency; see 'tk')
BEPB	Bangladesh Export Promotion Bureau
BGD	Bangladesh
CF	Channel factor
CFHC	Channel factor - horizontal competition
CFSI	Channel factor - suppliers' influence
CFVC	Channel Factor - vertical conflict
COV-SEM	Covariance-based Structural Equation Modelling
CR	Composite Reliability
DFID	Department for International Development (UK)
DoF	Department of Fisheries (Bangladesh)
DoI	Diffusion of Innovation (theory)
f^2	Effect size
FAO	Food and Agriculture Organization
FY	Financial Year
GDP	Gross Domestic Product
GNP	Gross National Product
IF	Individual Factors
INC	Intention to be Engaged with a Cooperative
IT	Information Technology
LOS	Level of Significance
NGO	Non-governmental Organization
PB	Perceived Barrier to a Cooperative
PBC	Perceived Benefit of a Cooperative
PBCAI	Perceived Benefit (of cooperative) – Alternative Income
PBCC	Perceived Benefit (of cooperative) – Compatibility
PBCL	Perceived Behavioural Control
PBCMI	Perceived Benefit (of cooperative) – More Income
PBLT	Perceived Barrier (of cooperative) - Lack of Trust
PBLU	Perceived Barrier (of cooperative) - Lack of Unity

PHP	Philippine peso
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares-based Structural Equation Modelling
PSL	Perceived Sustainable Livelihood
R^2	Coefficient of Determination
RO	Research Objective
RQ	Research Question
SD	Standard Deviation
SEM	Structural Equation Modelling
SF	Situational Factor
SFGS	Situational Factor – Government Support
SFNS	Situational Factor –NGO Support
SI	Social Influence
SIFI	Social Influence – Family Influences
SIPI	Social Influence – Peer Influences
SMS	Short Message Service (i.e. text messaging)
SPSS	IBM SPSS Statistics (software)
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UK	United Kingdom
UNDP	United Nations Development Program
US/USA	United States of America
USAID	United States Agency for International Development
VCA	Value Chain Analysis
VIF	Variance Inflation Factor
WSSV	White Spot Syndrome Virus

Abstract

The crab sector of Bangladesh provides livelihood for millions of fishers, traders, transporters and exporters. However, the fishers are marginalized and their livelihood is vulnerable to various risks. This is primarily due to the existing cumbersome and manipulative crab value chain where the fishers are usually exploited by the middlemen. This threatens their access to basic livelihood assets. Extant research supports the notion of revising the existing mud crab value chain for the overall benefits of the fishers. Yet no research thus far focuses on how to revise the existing mud crab value chain, nor has an improved value chain been investigated to see if it would be adopted by the current value chain participants. This research investigates how to enhance the sustainable livelihood of coastal mud crab fishers of Bangladesh. The study explores three research questions: (a) what are the impacts of the existing mud crab value chain on the sustainable livelihood of crab fishers in coastal Bangladesh? (b) how can the social business model be used to develop an improved mud crab value chain to enrich the livelihood of crab fishers? and (c) is the cooperative-based revised value chain acceptable to various stakeholders of the mud crab sector? To conduct this research, a mixed-methods approach is adopted, in which a qualitative research approach (through the in-depth group interview method) is first pursued followed by a quantitative research study (through the survey method).

The qualitative field study revealed that the existing mud crab value chain is long and complex, consisting of numerous participants such as crab fishers, collectors, crab suppliers (or *aratders*), depot owners, exporters' agents, exporters and local retailers. Guided by the UK Department for International Development (DFID)'s sustainable livelihood model, this study explores the effects of the current mud crab value chain on crab fishers' livelihood. It has been found that their livelihood is under threat due to their lack of access to the five key resources or capital bases (natural capital, physical capital, social capital, human capital and financial capital) that are necessary for a sustainable livelihood. It has also been found that the crab fishers are strongly dominated by the crab suppliers. Not only are the crab suppliers socially powerful but they also control the market information, with the fishers unable to access anyone else to whom they can sell their crab

catches. In seeking to revise the current mud crab value chain (to help the crab fishers achieve a sustainable livelihood), this research proposes a revised cooperative-based mud crab value chain in which the cooperative will be run based on the principles of the social business model of Nobel Laureate Professor Muhammed Yunus. In the current study's quantitative survey, it has been found that individual factors (skill, experience and involvement) and channel factors (supplier influence, horizontal competition and vertical conflict) influence crab fishers' perceptions of the benefits to be received and the barriers to be encountered from the proposed fishers' cooperative, with these eventually influencing their attitude and intention to be engaged in the proposed cooperative-based revised mud crab value chain. Furthermore, it has been found that, by being involved with the proposed cooperative, the crab fishers will be able to increase their income and enhance their sustainable livelihood.

The research has significant theoretical, practical and methodological implications. In terms of its theoretical contribution, this study extends the concept of the social business and shows its application in the context of the mud crab value chain. It views the cooperative as a social business entity and shows that a cooperative guided by the social business concept can enhance the sustainable livelihood of the mud crab fishers. Guided by the social business concept, this study shows empirical evidence in support of the factors influencing adoption of the new cooperative-based mud crab value chain by existing channel members. With regard to its practical implications, the research findings offer a better understanding of the drawbacks of the existing mud crab value chain and suggest an alternative mud crab value chain that could help the crab fishers attain a sustainable livelihood. The government and/or non-governmental organizations (NGOs) will benefit from the factors that were found to influence the adoption of a new cooperative-based mud crab value chain. Thus, the study findings will help national policy makers and existing crab fishing channel members by providing effective guidelines to successfully introduce a cooperative within the crab business. In terms of its methodological contribution, this research develops and demonstrates the empirical usefulness of the measures for several constructs which can be used in future research.

CHAPTER 1

INTRODUCTION

1.0 RESEARCH BACKGROUND

Bangladesh, the world's largest deltaic region, lies in the north-eastern part of South Asia. It is primarily an agro-based country with enriched marine biodiversity (Rahman, 2015). Crab fishery is now an important economic activity in Bangladesh. Of the many species of crab, the major species for export is the mud crab (*Scylla serrata*). Mud crab is now the most commercially important crab species in Bangladesh and is widely distributed along the coastline of the Bay of Bengal. It is available in brackish coastal waters and estuaries and has great potential for aquaculture (Begum et al., 2009). The domestic market for mud crab in Bangladesh is very small due to the predominant Muslim population having social and religious restrictions on the eating of crab (Zafar & Ahsan, 2006). The local consumption of crab is limited to the Hindu community and tribal people. On the other hand, the international market for crab possesses immense potential due to the huge demand for crab and crab meat in different countries of the world.

Mud crab (*Scylla serrata*) is one of the most popular and expensive types of seafood in South East Asian countries (Chandra et al., 2012; Pripanapong & Tongdee, 1998), and Bangladesh is one of the key exporters of mud crab to these countries. The country earns about US$6 million per year by exporting 1,500 metric tons of live mud crab to different countries of the world, including Singapore, Hong Kong, China, Taiwan and Japan.[1] The crab sector of Bangladesh has become a high-value export fishery involving trade in nearly 23 countries worldwide with great demand in Malaysia, Singapore and Taiwan (Ferdoushi et al., 2010). As a result, the importance of live mud crab as an export commodity has opened a great opportunity for crab fishers. Due to the increasing demand for mud crab in local and international markets, crab fishery has been gaining popularity among the coastal communities in the greater Khulna and Chittagong regions (Begum et al., 2009).

[1] <http://en.banglapedia.org/index.php?title=Crab>

The crab sector of Bangladesh provides the livelihood for millions of fishers, traders, transporters and exporters (Molla et al., 2009; Zafar et al., 2004). Although crab fishers are the key suppliers of raw crabs and initiate the value chain, they are the most marginalized group and are usually exploited by the middlemen (locally named as *forias* or *aratders*)[2] (Ferdoushi et al., 2010). These middlemen are the biggest beneficiaries in the current value chain (Chandra et al., 2012). In addition, despite the economic significance of the crab sector, the crab fishers in rural Bangladesh are one of the most neglected groups, comprising landless people, widows and orphans, all of whom suffer from low income due to seasonal fluctuations in collecting crabs (Zafar & Ahsan, 2006). Most (83.3%) are from the Hindu minority group of the population and they are usually exploited by the middlemen (locally named as *forias* or *aratders*) (Ferdoushi et al., 2010).

Therefore, most crab fishers in Bangladesh are marginalized and their livelihood is subject to significant risk. In addition, the existing mud crab value chain is long and unstructured and does not receive any government attention. Despite the growing export potential for crab, no structured marketing system for crab has yet been established in Bangladesh (Zafar et al., 2006). The existing drawbacks include price fluctuations, illiteracy, lack of market knowledge, a small domestic market, lower level of market intelligence, the poor bargaining power of fishers, lack of access to institutional credit, high crab mortality rate, poor local storage facilities and poor transportation. These drawbacks make the situation more vulnerable for the crab fishers and increase the vulnerability of the total crab marketing system (Chandra et al., 2012). Thus, the sustainable livelihood of the crab fishers is under threat.

1.1 RESEARCH PROBLEM

As is evident from the above discussion, the current mud crab value chain is long and dominated by the middlemen which have a negative impact on its performance. It is therefore essential to bring a change to the existing mud crab value chain. However, past research (e.g. Macfadyen et al., 2012) has argued that value chain analysis has not yet been widely adopted in the aquaculture sector, thus causing an inadequate understanding of the factors affecting the performance of the aquaculture value

[2] *Forias* or *aratders* are the middlemen who conduct business on a daily basis.

chain. The extant research has also supported the notion of revising the existing mud crab value chain for the overall benefit of the crab fishers (Zafar & Ahsan, 2006). However, no research has been conducted to date to suggest how to revise the mud crab value chain, nor has the revised value chain been investigated to see if it would be adopted by the existing value chain participants.

In seeking to discover ways to make the current mud crab value chain shorter in length and beneficial for the crab fishers, the current literature was found to emphasize on two primary strategies: vertical integration and introducing a cooperative. Vertical integration is one of the best ways to obtain efficiency in the value chain (Bagchi et al., 2005). The number of channel levels in the value chain can be reduced through vertical integration which reduces the cost of distribution and enhances the performance of the value chain. Thus, a firm will vertically integrate its value chain stages to lower its transaction cost (Williamson, 1975) and to improve performance (Gilley & Rasheed, 2000). Furthermore, the previous research has shown that vertical integration enables the attainment of market power (Hastings & Gilbert, 2005; Normann, 2009) and influences the price and quality of a final product (e.g. Arya et al., 2008; Matsubayashi, 2007). On the other hand, due to increased global competition, introducing a cooperative and mutually beneficial value chain partnership has become a high priority for many organizations (Lambert & Cooper, 2000; Wisner & Tan, 2000; Hvolby et al., 2007). In the fishery sector, the cooperative has gained increasing acceptance among governments, development agencies and researchers as an appropriate arrangement of future fisheries management systems (Nielsen et al., 2004). The cooperative enables the collective participation of all related stakeholders in managing and operating the entity based on the principles of cooperation instead of those of competition. These collective actions enable increased vertical integration in the value chain and result in improved marketing capacity (Kaganzi et al., 2009; Komarudin et al., 2007; Paumgarten et al., 2012). Co-management is a proven tool to reduce the high transaction costs associated with fishery management (Scott, 1993; Pearse & Wilson, 1999) and to improve the bargaining position of small farmers (Roy & Thorat, 2008; Fischer & Qaim, 2012). Gurung et al. (2005) showed evidence that participatory fishery management practices substantially improved the livelihood of the fishers' community in Nepal. The cooperative has also proved to be an effective tool in

fishery management in other parts of the world, such as in Japan (Shima, 1983; Jentoft, 1989) and in Turkey (Berkes, 1986; Jentoft, 1989).

Although vertical integration and the cooperative are proven ways of improving an existing value chain, neither has been assessed in the mud crab sector of Bangladesh. As previously mentioned, vertical integration enables the reduction of channel levels and the attainment of market power, and contributes to the end-price of the finished product (Arya et al., 2008; Normann, 2009). However, vertical integration may not ensure a fair price at the harvesters' (crab fishers') level and, thus, it may not be able to contribute to ensuring their sustainable livelihood. On the other hand, the cooperative has already proved to be an appropriate arrangement for fishery management in South Asian countries (Gurung et al., 2005), although existing research has documented some unsuccessful cases involving cooperatives (Pomeroy et al., 2001). There is the possibility that the cooperative could malfunction and not perform as planned and, therefore, it may fail to deliver the desired benefits (Grewal et al., 1994). In particular, the optimum governance of the cooperative (i.e. the authority and power relations to run the cooperative) is crucial for its success (Kaplinsky & Morris, 2001). In these circumstances, the cooperative can be considered as the ideal remedy in the context of the mud crab value chain, if the required support from existing value chain members can be ensured through an effective governance system, which is currently absent in the existing mud crab value chain. As the cooperative is likely to encompass vertical integration of value chain activities such as fishing, processing, etc. and will be operated based on membership and the principles of cooperation (Jentoft, 1989), instead of those of competition, this will help to ensure a fair price for the crab fishers and will break the exploitation trap.

Due to their poor economic conditions, crab fishers are usually in competition with each other to sell their entire catch to the local crab supplier. The existing mud crab value chain therefore threatens the livelihood of mud crab fishers, causing a social problem in rural coastal Bangladesh. Hence, this research borrows the concept of the social business model to develop an improved mud crab value chain by establishing a fishers' cooperative to ensure a sustainable livelihood for the crab fishers. The social business, as advocated by Nobel Laureate Professor Muhammed Yunus, is a non-loss, non-dividend and self-sustaining company the primary purpose

of which is to serve society by focusing on a specific social issue (problem) and solving it with entrepreneurial efforts (Yunus, 2009). Again, as discussed earlier, the concept of the cooperative and/or co-management has been successfully introduced in the fishery distribution channel in many developing countries in Asia (Pomeroy, 1995; Pomeroy et al., 2001), and has eventually contributed to the overall benefit of farmers and/or fishers. The cooperative as a community institution facilitates the co-management and participation of all related stakeholders (Zafar & Ahsan, 2006): its operation and guiding principles can be developed based on social business principles. This enables the cooperative to run with the aim of dealing with a specific social issue (such as, in this context, ensuring a sustainable livelihood for crab fishers). Therefore, this research studies the introduction of a cooperative in the mud crab value chain in Bangladesh, with the aim to enhance the sustainable livelihood of marginalized crab fishers' by integrating the existing value chain participants under one umbrella. However, before introducing a cooperative into the mud crab value chain, it is of utmost importance to explore whether the crab fishers and other value chain participants are willing to adopt the new cooperative-based mud crab value chain. Moreover, it is necessary to decide which channel levels need to be integrated under the umbrella of the cooperative and whether introducing a fishers' cooperative would contribute to the attainment of a sustainable livelihood for the crab fishers. Guided by these pertinent issues, the researcher has formulated the following research questions and objectives for the study.

1.2 RESEARCH QUESTIONS AND OBJECTIVES

The underlying research problem addressed in this study has been articulated in the previous section. Accordingly, this study investigates the following research questions (RQs):

RQ1: What are the effects of the existing mud crab value chain on the sustainable livelihood of crab fishers in coastal Bangladesh?

RQ2: How can the social business model be used to develop an improved mud crab value chain to enrich the livelihood of crab fishers?

RQ3: Is the cooperative-based value chain acceptable to the various stakeholders of the mud crab industry?

Based on the above research questions, the specific research objectives (ROs) of this study are:

RO1: To investigate the impact of the existing mud crab value chain on the livelihood of channel members with a special focus on the livelihood of crab fishers.

RO2: To explore how the social business model can be used to develop an improved mud crab value chain.

RO3: To identify the factors that influence the acceptability of the new mud crab value chain by value chain participants with a special focus on crab fishers.

RO4: To examine the effects of adopting the new mud crab value chain on the livelihood of crab fishers.

1.3 DEFINITION OF TERMS

The following terms are used extensively throughout the thesis, with their operational definitions outlined below:

Value chain: A value chain can be described as the range of activities required to bring a product or service from conception through the intermediary phases of production to delivery to the final consumers (Kaplinsky, 2000). Porter (1980) defined the value chain as a sequential set of primary and support activities that a firm performs to turn inputs into value-added outputs for its external customers. The value chain is a business system which creates end-user satisfaction in terms of the value received and realizes the objectives of the other member stakeholders (Walters & Lancaster, 2000).

Sustainable livelihood: A livelihood is the way of earning a living by an individual or household that is a combination of the individual's or household's assets, including activities and resources, and access to those assets (Tang et al., 2013). It is linked with social and human factors and comprises the capabilities, assets and activities required to obtain the means of living (Chambers & Conway, 1992). A livelihood is sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets, while not undermining the natural resources base (Scoones, 2009).

Social business: A social business is a non-loss, non-dividend and self-sustaining company. Nobel Laureate Professor Muhammed Yunus is the key proponent of the social business concept. Its primary purpose is to serve society by focusing on a specific social issue (or problem) and solving it with entrepreneurial efforts (Yunus, 2009). A social business has products, services, customers, markets, expenses and revenues like any other regular enterprise. It is not a charity; rather, it is a business in every sense. The key difference between a social business and a conventional business is that a social business is more a cause-driven effort than one that is profit-driven. The owners are entitled to recover their invested money but they are not entitled to take any dividend (Yunus et al., 2010). Rather, the profit of the social enterprise is used for expansion of the business, with this targeted to solve another social problem.

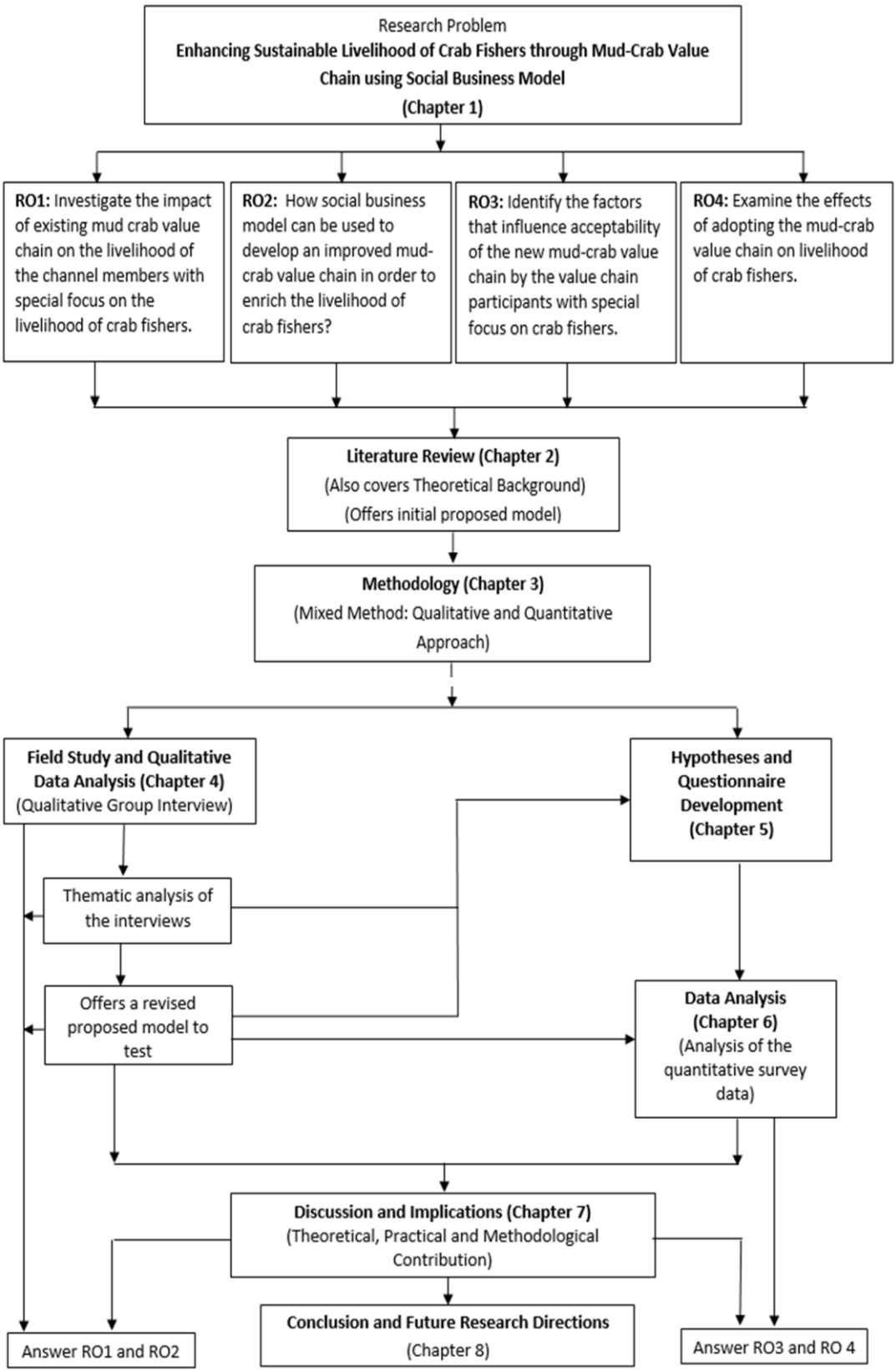
Cooperative: A cooperative, often termed as co-management, is the sharing of management authority and responsibility between two or more agencies or identifiable elements of the users (Pinkerton, 1989). A cooperative enables the collective participation of all related stakeholders in managing and operating the entity, based on the principles of cooperation. Such collective actions enable increased vertical integration in the value chain and result in improved marketing capacity (Kaganzi et al., 2009; Paumgarten et al., 2012). In the fishery sector, the cooperative has gained increasing acceptance among governments, development agencies and researchers as an appropriate arrangement of future fishery management systems (Nielsen et al., 2004).

Vertical integration: Vertical integration occurs when one firm carries out two or more consecutive stages of the value chain (Hobbs, 1996). Vertical integration enables the attainment of market power (Hastings & Gilbert, 2005; Normann, 2009) and influences the price and quality of a final product (e.g. Arya et al., 2008; Matsubayashi, 2007).

1.4 SCHEMATIC VIEW OF THE THESIS

The schematic view of the thesis, shown in Figure 1.1 below, is self-explanatory.

Figure 1.1 Schematic view of the thesis



1.5 BRIEF METHODOLOGY

This research is conducted based on the mixed-methods approach (Creswell, 2009), in which the qualitative research approach was first pursued followed by the quantitative approach. Both qualitative and quantitative research approaches were used to address the pre-determined research questions and objectives. The qualitative research method was used to address the first and second research objectives, and the quantitative research approach was used to address the third and fourth research objectives.

In the qualitative approach, six group interviews were conducted among the crab fishers and crab suppliers. A total of 32 respondents participated in these six group interviews. The group interviews were conducted in the two coastal areas of Bangladesh: the south-east coastal region (greater Chittagong division) and the south-west coastal region (Khulna division). The interviews were recorded, transcribed verbatim and analysed through deductive thematic analysis. The analysis of the qualitative data: (a) explores the existing long and complex mud crab value chain and its participants; (b) investigates the current poor unsustainable livelihood situation of the crab fishers; (c) indicates that the social business model can be used (through establishing a fishers' cooperative in the mud crab value chain) to develop an improved mud crab value chain and thus help to enhance the livelihood conditions of the crab fishers. Furthermore, the qualitative study offers a conceptual framework for assessing the adoption of a revised cooperative-based mud crab value chain. The details of the qualitative study are presented in Chapter 4.

The conceptual framework offered by the qualitative field study was examined through the quantitative approach, in which a structured survey was conducted among the 185 crab fishers and 89 crab suppliers using two separate questionnaires. The data collected from the survey were analysed through structural equation modelling (SEM) using Smart PLS3 software (Hair et al., 2016). The findings of the quantitative study addressed the third and fourth research objectives of this research by presenting empirical evidence in support of: (a) the factors that were found to influence the respondents' intention to adopt the proposed cooperative-based mud crab value chain; and (b) the positive influence of the intention to adopt the proposed cooperative-based mud crab value chain on the

perceived sustainable livelihood of the crab fishers. The quantitative study is presented in greater detail in Chapter 6.

1.6 SIGNIFICANCE OF THE STUDY

The research has significant theoretical, practical and methodological implications. Under the theoretical contribution, this study extends the concept of the social business and shows its application in the context of the mud crab value chain. It views the cooperative as a social business entity and shows that a cooperative guided by the social business concept can enhance the sustainable livelihood of the mud crab fishers. Guided by the social business concept, this study provides empirical evidence supportive of the factors that were found to influence the adoption of the new cooperative-based mud crab value chain by existing channel members. Thus, the study extends the existing knowledge in the social business and cooperative literature.

With regard to the practical implications, the research findings offer a better understanding of the drawbacks of the existing mud crab value chain and suggest an alternative mud crab value chain that could help the crab fishers attain a sustainable livelihood. The government and/or non-governmental organizations (NGOs) will benefit from knowing the factors that were found to influence the adoption of a new cooperative-based mud crab value chain. Thus, this study's findings will help national policy makers and existing crab fishing channel members by providing effective guidelines to successfully introduce a cooperative within the crab business.

In terms of its methodological contribution, this research develops and presents the empirical usefulness of the measures for several constructs, with these able to be used in future research. Although these measures are primarily from the existing literature, they are comprehensive in nature and contextually-driven; hence, they can be used by the future researcher who intends to work in the broad area of the adoption of a cooperative.

1.7 CHAPTER SUMMARY AND THESIS STRUCTURE

The study was developed to investigate the research problem titled, "Enhancing the Sustainable Livelihood of Crab Fishers through the Mud Crab Value Chain using the Social Business Model". The thesis has been conducted following a mixed-methods

approach (a qualitative field study followed by a quantitative survey) and includes eight chapters in total. The chapter summary and the thesis structure are outlined below:

Chapter 1 focuses on the background to the study and identifies the research problem as derived from different research gaps in the existing literature. The research questions and objectives addressed in the study are then outlined. The definition of different terms used in the thesis; the schematic view of the thesis; the study's research methodology; and the research significance from theoretical, practical and methodological points of view are discussed. The chapter concludes with the chapter summary and an overview of the structure of the thesis.

Chapter 2 presents the exhaustive literature review conducted on different issues related to the mud crab sector of Bangladesh, namely, value chain analysis; the cooperative; vertical integration; the social business; and a sustainable livelihood. The chapter starts with an introduction followed by a brief overview of the mud crab sector from the world view as well as in the Bangladesh context. Next, the chapter discusses the relevant literature on value chain analysis; mud crab value chain analysis from the Bangladesh perspective; revision of the existing value chain using vertical integration and the cooperative; and a sustainable livelihood. The chapter outlines the relevant theories of the study, namely, the social business model and the theory of planned behaviour (TPB). While discussing the literature and the theories, the researcher outlined the relevant research gap and finally came up with an initial conceptual framework which was assessed in subsequent chapters.

Chapter 3 is used to discuss the research methodology. The chapter outlines the mixed-methods research design covering a two-stage research process: a qualitative field study to revise and enhance the conceptual framework developed from the literature review chapter and a quantitative survey conducted to test the research hypotheses. Also described is the qualitative field study which develops a survey instrument used in the quantitative method. The paradigm of the mixed methodology approach is first described, and the method of conducting the qualitative and quantitative stages of the research is then outlined.

Chapter 4 deals with the qualitative field study and the development of the final research model. It presents the detailed process of conducting the field study

and outlines the results of the qualitative data analyses. The chapter points out the rationale of conducting a field study using the group interview method, and presents a brief sample profile for the field study; the data analysis process in terms of coding (deductive) and the themes (under thematic analysis); and a wide discussion of the factors and variables identified during the interviews. The chapter also illustrates the final model of the study by incorporating the field study results and the factors identified from the literature review.

In Chapter 5 of the thesis, the hypotheses developed for the study and the questionnaire development for conducting the survey are outlined. Each hypothesis is formulated systematically using adequate support from the existing literature and relevant theories and contextualised using the field study findings. Following the hypotheses development section, two separate questionnaires (one for crab fishers and the other for crab suppliers) were developed, with the chapter outlining the procedure including the measures of the constructs and their respective sources. A brief description of the pre-testing of the survey instrument is also presented at the end of the chapter.

Chapter 6 of the thesis deals with analysis of the quantitative data. It presents detailed analyses of the quantitative data, including the rationale for sample size; assessments of non-response bias and common method bias; justification of formative and reflective constructs; measurement model estimation; and assessment of the psychometric properties of the constructs used in the model, with this followed by the structural model estimation.

Chapter 7 contains the detailed discussions of the insights derived from the results of both qualitative and quantitative data analyses. It includes how the four research objectives outlined in Chapter 1 have been addressed. Furthermore, the chapter discusses each of the hypotheses in terms of comparison and contrast with existing research. The theoretical, practical and methodological implications of the results are provided in this chapter.

Chapter 8, the final chapter, outlines the conclusion and future research directions of the research. This chapter provides an overview of the study, discusses its limitations and presents a brief discussion of possible future research directions in the relevant subject area of the study.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

In this chapter, the relevant literature and background theories relating to the value chain, sustainable livelihood and the adoption of a new value chain are discussed. The chapter begins with an overview of the mud crab sector from the global view which is compared to the same sector from the Bangladesh view. Relevant theoretical discussion on value chain analysis is then presented, with this including Porter's value chain model, and improving the value chain through vertical integration and introduction of a cooperative. The chapter then presents the theoretical background in terms of the social business, the applicability of the social business concept in a cooperative context and the governing philosophy of a cooperative. The chapter concludes with a proposed research model based on the existing literature and the research gaps derived from the literature review.

2.1 MUD CRAB SECTOR: WORLD VIEW VS BANGLADESH VIEW

The fishery sector in general is a source of income and livelihood for millions of people around the world. Global production of fish, crustaceans (the crab is a variety of crustacean), molluscs and other aquatic creatures was about 167.2 million tonnes in 2014 (FAO, 2014). World fish aquaculture production during the same year was 73.8 million tonnes of which crustaceans accounted for 9% (6.9 million tonnes) (FAO, 2014). Approximately 96% of the world's aquatic products are sourced from developing countries as producers. The contribution of aquaculture to total fish production has risen steadily, reaching 44% in 2014. In addition to fishery production and selling, this sector contributed significantly by employing millions of people. For example during 2008, 44.9 million people were directly engaged, full-time or, more frequently, part-time, in small-scale fisheries. This number represents a 167% increase compared to the 16.7 million people in 1980 (FAO, 2010). During 2013, the fishery sector provided more than 3.1 billion people globally with almost 20% of their average per capita intake of animal protein (FAO, 2014). Leading fish and aquatic product-producing countries in the world include China (produced 45.5 million tonnes in 2014 which was more than 60% of global fish production),

India (4.9 million tonnes), Indonesia (4.3 million tonnes), Vietnam (3.4 million tonnes) and Bangladesh (2 million tonnes) (FAO, 2014).

During 2014, fishery exports from developing countries were valued at US$80 billion, and their fishery net export revenues (exports minus imports) reached US$42 billion, higher than the combined total of other major agricultural commodities (such as meat, tobacco, rice and sugar) (FAO, 2014). The share of developing countries in total fishery exports was about 54% by value and 60% by quantity (live weight equivalent) in 2014. The fishery net exports of developing countries (i.e. the total value of their exports less the total value of their imports) have shown a continuing rising trend in recent decades, growing from US$16 billion in 1994 to US$20 billion in 2004 and US$42 billion in 2014. These figures were significantly higher than those for other agricultural commodities such as rice, coffee and tea.

Crab, as an important component of the fishery sector, contributes to the economic development of different countries across the world. For example, crab has a successful history of trade and culture in South East Asian countries, earning foreign currencies from international markets (Cowan, 1984). Mud crab culture in mangroves of tidal flats has been practised in Indonesia, Vietnam and China (SEAFDEC, 1997). China is the largest producer of crab with 45.5 million tonnes in 2014 (FAO, 2016) whereas the Philippines is the second largest producer of cultured mud crab with 9,274 million tonnes, valued at Philippine peso (PHP) 293,333 (BAS, 2008). In the Philippines, mud crab culture was introduced to provide an alternative livelihood for fishers in rural villages (Triño & Rodriquez, 1999). In Africa, mud crab is also cultured and traded in Kenya, although the method of culture is a bit different (Mwaluma, 2002). As shown by the more recent 2014 statistics, China accounted for 45.5 million tonnes in 2014 (more than 60%) of global fish production from aquaculture. Other major producers were India, Vietnam, Bangladesh and Egypt. In 2014, 84% of the global population engaging in the fisheries and aquaculture sector was in Asia, followed by Africa (10%), and Latin America and the Caribbean (4%). Of the 18 million people engaged in fish farming, 94% were in Asia. The main destinations for the export of live crabs were Hong Kong (854 million tonnes), Singapore (531 million tonnes) and Taiwan (222 million tonnes), each of which have relatively significant Chinese communities. The market

continues to grow for mud crab meat as a value-added product and for frozen soft-shelled mud crab in the United State (USA) (Keenan, 1999; Wickins & Lee, 2002). The continued increase in the exports of live mud crab is expected to play an important role in the foreign exchange earnings of Bangladesh if properly harnessed (Adeogun et al., 2009).

Mud crab production worldwide has been increasing in recent years. As shown in Figure 2.1, the world mud crab production has increased from about 110,000 tonnes in 2005 to more than 180,000 tonnes in 2014.

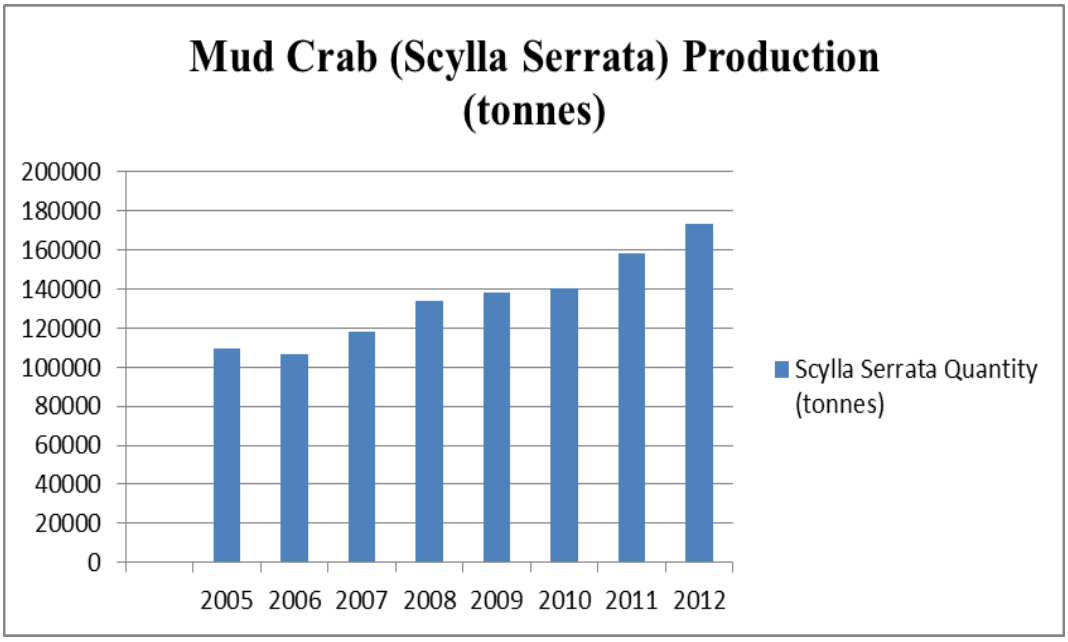


Figure 2.1: World's Mud Crab Production (in Tonnes)

(Source: FAO, 2014)

Next, the situation of mud crab in the Bangladesh context is outlined below.

2.1.1 Bangladesh View

Bangladesh is a developing country with rich biological diversity (Ahamed et al., 2012). The country has 710 km of coastline located in the northern and north-eastern part along the Bay of Bengal (Rahman et al., 2010). The coastline can be divided into three regions: the south-western, the central and the south-eastern regions (Azad et al., 2008) (see Figure 2.2(a) and Figure 2.2(b) below). The Bangladesh coastal and marine zones have a rich ecosystem characterized by high productivity and mangrove influences that are unique in the world (Islam, 2003). As a nursery ground, this

ecosystem aids many fish, prawns, crabs, molluscs and other different aquatic species providing them with a physiologically suitable environment with respect to temperature, salinity and other physiochemical parameters (Ahamed et al., 2012).

Figure 2.2(a)

Figure 2.2(b)

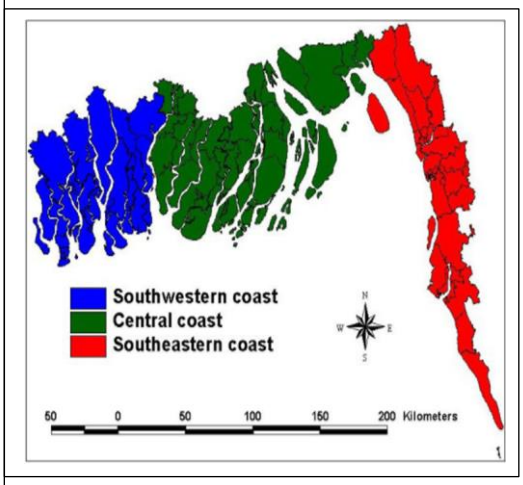


Figure 2.2(a) and Figure 2.2(b): Geographical location and coastal areas of Bangladesh

Fishing is an important economic activity in many developing countries, including Bangladesh. In Bangladesh, fisheries make a 5.24% contribution to gross domestic product (GDP), with the sector's value to gross national product (GNP) being approximately Bangladesh taka (BDT) 150,486 million (US$1 = BDT 70). The fisheries sub-sector provides full-time employment to over 1.2 million people, of whom 0.5 million are involved in marine fisheries (DoF, 2010). Bangladesh is ranked fifth in the world's aquaculture production with a total production of 3,410 million tonnes: the annual GDP contribution of the fisheries sector is currently 3.8%.

Bangladesh is one of the prominent aquatic and marine product-producing nations in the world. Crab is one of the most vital marine species and is found in abundance in the coastal areas of Bangladesh (Paul & Vogl, 2011). In all, 16 species

of crab have been reported (Khan, 2005) of which 10 are available in coastal waters (Chowdhury & Hafizuddin, 1991). Ferdoushi and Xiang-Guo (2010) reported that 13 marine species and three species of freshwater crab are found in Bangladesh. Among all the identified species of crab, *Scylla serrata* (mud crab), is the most popular and costly seafood in South East Asian countries (Pripanapong & Tongdee 1998). It is also one of the most commercially value-adding aquatic species in Bangladesh (Shafi & Quddus, 1982; Salam et al., 2005). Mud crab (*Scylla serrata*) is abundantly available in the Indo-West-Pacific region as mangrove-associated fauna (Macintosh et al., 2002) and is suitable for coastal aquaculture (Islam, 2003). It has high demand in the international market with immense economic value and following after shrimp which occupies the top position (Chandra et al., 2012). The domestic market for crab in Bangladesh is very slim due to the predominantly Muslim population having social and religious restrictions on eating crabs (Zafar & Ahsan, 2006). The local consumption of crab is limited to the Hindu community and tribal people. On the other hand, the international market for crab has immense potential due to the huge demand for crab and crab meats in different countries of the world. Total export earnings from mud crab in the year 2013–14 were US$22,909,159.62 (BEPB, 2015-16). Thus, the crab sector of Bangladesh has immense economic potential.

The coastal region of Bangladesh is highly accessible for mud crabs which inhabit marine and brackish waters (Zafar et al., 2004) especially in estuaries, the tidal rivers of mangrove swamps and coastal ghers (modified rice fields with high, broad peripheral dykes) (Khan & Farukul, 1992; Molla et al., 2009). Mud crabs are also found in abundance with high density in the south-eastern (Cox's Bazar, Chittagong district) and south-western (Khulna, Satkhira and Bagerhat districts) parts of Bangladesh (Ferdoushi et al., 2010; Khan & Farukul, 1991). Mud crab is also consumed as a food by different fishes and aquatic creatures, such as estuarine crocodiles, sharks, turtles, etc. and also as poultry feed (Lee, 1991; Molla et al., 2009). Mud crab has been treated as a subsidiary product with prawns and other fin fishes in South East Asian countries (Chandrasekaran & Perumal, 1993). It is also a good source of animal protein as the proximate food value of crab is: protein 11%, carbohydrate 0.71%, fat 0.38%, moisture 85.7% and ash (inorganic material) 1.54% (Edwards & Early, 1976). Thus, through crab fishery, domestic protein deficiency can be met by placing more emphasis on the production and consumption of crab. In

recent times, crab fishing has become more popular in Bangladesh after the government implementation of stringent regulations on capture-based shrimp farming (Zafar et al., 2004).

In addition, farmers are seeking alternative species for sustainable aquaculture practices due to the spread of diseases, particularly the white spot syndrome virus (WSSV) which is at epidemic levels in shrimp culture. Farmers' increasing interest in crab farming as the replacement for shrimp farming is also compensating them economically and environmentally (Ferdoushi et al., 2010). Thus, the above-mentioned facts support the potential and opportunities for the growth of the crab sector in Bangladesh. It will also help to generate new employment, alternative income for poor fisheries, reduce the vulnerability of the coastal communities, and provide an additional supply of animal protein for them and even for the world.

The economic potential of Bangladesh's crab sector is also well supported by the increasing trend of crab and other fishery production and exports from Bangladesh. Figure 2.3 below shows that the production of fish, crustaceans (crab is in this category), molluscs, etc. in Bangladesh has increased from 882,091 tonnes (with a corresponding value of US$1,246,479) in 2005 to 1,956,925 tonnes (with a corresponding value of US$4,853,274) during 2014. Crab export-related information is discussed in the next paragraph.

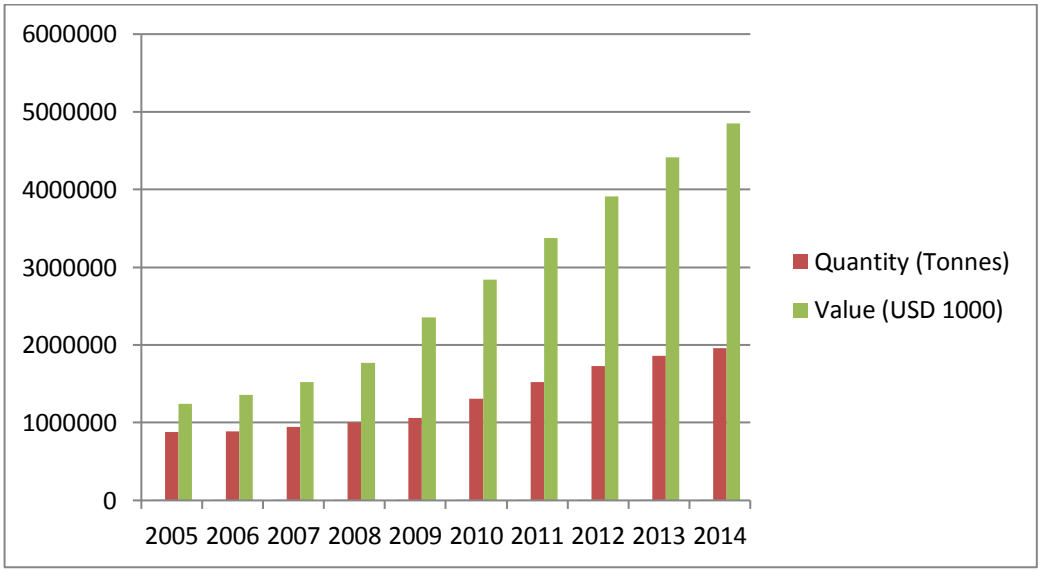


Figure 2.3: Aquaculture production of fish, crustaceans (crabs), molluscs, etc. in Bangladesh (Source: FAO, 2014)

Crab is one of the most popular and expensive seafood items in South East Asian countries (Chandra et al., 2012; Pripanapong & Tongdee, 1998). There is immense potential of Bangladeshi crab and crab meats in different countries of the world. Bangladesh started exporting mud crab commercially in 1977–78 and, since then, the value of export earnings has increased steadily from US$2,000 to US$3,780,000 in 1992–93 (Ali et al., 2004; Ferdoushi et al., 2010). In 2015–16, the export earnings from the crab sector totalled US$18,588,169.44 million (BEPB, 2016). The total value of this business has increased many times over in the last few decades (BEPB, 2002; Chandra et al., 2012). Moreover, the crab sector of Bangladesh has become a high-value export fishery which involves trade in nearly 23 countries worldwide with great demand in Malaysia, Singapore and Taiwan (Ferdoushi et al., 2010). China, the USA, Japan, Korea and Thailand are the top five ranked buyers of crab in the world (Breinl & Miles, 1994; Ferdoushi et al., 2010): Bangladesh exports crab to all of these countries showing an upward trend in each year except July 2014–June 2015, with this result due to political turmoil. Figure 2.4 shows crab exports from Bangladesh to the world market.

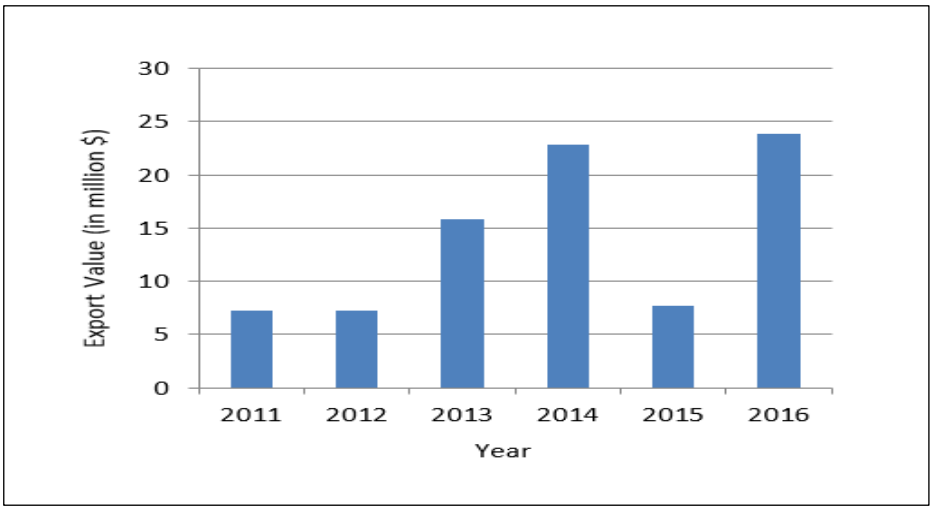


Figure 2.4: Crab export value from Bangladesh to the world market

(Source: BEPB, 2016)

Although Figure 2.4 shows the fluctuating trend of Bangladesh export earnings from the crab sector, the export value of crab increased substantially during 2016 to approximately US$24 million. Mud crab was the third largest source of foreign earnings from exporting frozen fish and food in 2002 and 2006 (Ferdoushi et al., 2010; Chandra et al., 2012; DoF, 2008). Almost 90% of mud crabs for export

come from natural sources while the remainder come from fattening centres[3] in Bangladesh (Ferdoushi et al., 2010; Zafar & Ahsan, 2006). The earnings from crab exports increased from 2,973 tonnes during 2008–09 and 4,416 tonnes in the 2011–12 financial year (FY) to 8,520 tonnes in 2013–14. The country earned US$15.83 million from crab exports in the 2012–13 FY. The export earnings from mud crab during 2011–2012 were US$7,442,311.97[4] with a 60.08% increase in export earnings from the year 2006–07 (BEPB, 2011-12). Crab exports earned $22.91 million in 2013–14 FY (BEPB, 2014). More than 96% of total crab export earnings came from East Asian and South Asian countries (Ferdoushi et al., 2010), with Taiwan and Malaysia the largest consumers providing earnings of US$6,280,000 and US$6,286,000, respectively. Of the total earnings, 60% comes from these two countries (BEPB, 2007; Ferdoushi et al., 2010). In addition, the US market is providing a growing demand for soft shell mud crab (Ferdoushi et al., 2010; Keenan, 1999).

Based on export earnings and the emerging foreign market for mud crab, it is clear that it is high time to concentrate on this sector. Despite these positive outcomes, the Bangladesh government is less focused on the crab sub-sector, thus hindering its growth. In addition, the local demand for crab is low due to religious observance or restrictions, thus further encouraging more exports (Ferdoushi et al., 2010). The extended and complex value chain and marketing system is an obstacle to the effective progress of this sector (Zafar & Ahsan, 2006). Moreover, crab fishers are predominantly illiterate and poor. The lack of effective government support, the absence of formal loans for crab fishers, the lack of adequate market information useful for crab fishers, etc. are all contributing to the poor performance and development of the mud crab sub-sector in Bangladesh. The need for further study is prompted by these mud crab value chain issues so a possible way can be found of achieving a smoothly functioning crab business and a sustainable livelihood for the crab fishers.

[3] Fattening centre consists of fattening ponds where the underweight and grade rejected crabs are kept to nurture for a while until they become a reasonable size for further sell in the market.
[4] Total crab exports include: frozen crab US$652,473.58; fried crab US$2,710,441.35; live crab US$3,872,666.15 (BEPB 2011–12, July-June)

2.2 VALUE CHAIN ANALYSIS

2.2.1 Definition of a Value Chain

The value chain of a product deals with the physical flows of goods from producer to consumers. It refers to the sequential set of primary and support activities that a firm performs to turn inputs into value-added outputs for its external customers (Porter, 1980). It is a business system that creates end-user satisfaction in terms of value received while realizing the objectives of other member stakeholders (Walters & Lancaster, 2000). Research on value chains has gone through a long history of development. It originated with French researchers in the 1960s when they started mapping the physical flows of commodities, especially those that originated from France's former colonies in Africa (Raikes et al., 2000). The value chain involves various steps and the researchers traced not only the movements of goods but also the variability of the values in each activity involved in the chain. The value chain helps to analyse the required value for the firm or industry and to discover possible ways to increase that value at every step through various techniques of value chain analysis. One of the widely used techniques of value chain analysis is Michael Porter's value chain model which is discussed below.

2.2.2 Value Chain Analysis – Porter's Model

As previously mentioned, a value chain is a sequence of activities to transform inputs into outputs with value added for the customers. Michael Porter (Porter, 1985) defined value chains as interlinked networks of firms, resources and knowledge streams in the creation and delivery of value to end-consumers. Porter's seminal work during the 1980s provided detailed explanations of the value chain concept.

Porter introduced the value chain theory, emphasized the industry backward chain and analysed the network of activities which establish coordinated linkages and improve production and organizational processes to capture greater value from the chain (Porter, 1987). Furthermore, he added that competitiveness could be attained through efficient management of the linkages and control over the activities in the industry. The value chain includes a full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of

various producer services), delivery to final consumers, and final disposal after use (Hempel, 2010). The range of activities is sequential, involving both primary and support activities that a firm performs to turn inputs into value-added outputs for its external customers (Porter, 1980). These activities are shown in Figure 2.5.

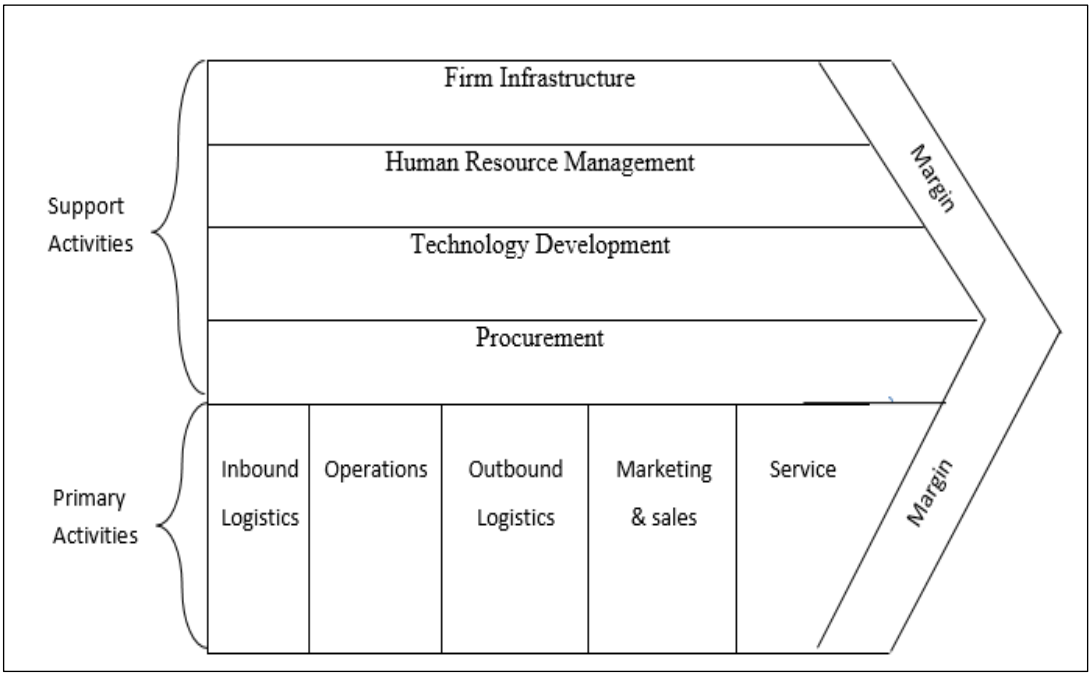


Figure 2.5 Porter's value chain analysis

Primary activities consist of inbound logistics, operations, outbound logistics, marketing and sales, and support services. Support activities include procurement, technology, human resources and the firm's infrastructure. Value chain analysis highlights that the activities within the organization add value to the services and products that the organization produces, and all these activities should be run at optimum level if the organization is to gain any real competitive advantage (Porter, 1985). If they are run efficiently, the value obtained should exceed the costs of operation; that is, customers should return to the organization and transact freely and willingly. Thus, one of the most important implications of the value chain approach is that all decisions made at one step in the process have consequences for the following steps, and often such decisions can be irreversible. This has a great impact on fishery value chain, in general, and in that of a crab value chain, in particular.

2.2.3 Applications of Value Chain Analysis across Industries and Countries

Value chain analysis (VCA) is a tool typically used in mapping the distribution chain of a product (McCormick & Schmitz, 2001; Humphrey, 2005; Van Rooyen et al., 2002). Due to its versatility, VCA is a tool that has been widely used in various sectors to assess progress in reforms, competitiveness of a sector, and performance of supply chain actors as well as identifying target areas needing further attention. It has been used in different industries across different countries to map the distribution process and the activities involved in bringing the product to consumers. Researchers use VCA not only to trace the movements of goods but also to assess the variability of the values in every activity, using full cost accounting to determine its relative cost and contribution to the whole production process (Raikes et al., 2000).

Value chain analysis (VCA) has been used to map relevant activities and to identify the parties involved in aquaculture and fishery distribution from farmer to final consumers across different countries. Mapping the flow of inputs—goods and services—in the production chain allows each firm to determine what other party or parties' behaviour plays an important role in its success (Kaplinsky & Morris, 2001). For example, Ohen and Dixie (2006) mapped the Nigerian aquaculture value chain, especially the physical movement of tilapia and catfish from the farmers to the ultimate consumers. Quagranie et al. (2007) focused on the aquaculture supply chain in Kenya and Ghana and identified key constraints affecting fish farmers. Thus, VCA is important as it helps in understanding the advantages and disadvantages of firms involved across the chain in moving products from stage to stage. It also helps the poor producers or farmers who are trying to enter new markets in a manner which would provide sustainable income growth (Kaplinsky & Morris, 2001).

In the fishery sector of Bangladesh, VCA has been used to make the entire chain more productive by transferring knowledge along the chain and improving relationships between the chain's actors which has provided higher income opportunities for all value chain participants (Humphrey & Navas-Alemán, 2010). Shamsuddoha (2007) studied the dried fish value chain from Cox's Bazar's coastal areas of Bangladesh and focused on the existing government policies supportive to the development and promotion of entrepreneurship among the fishers. In doing so, the author critically reflects on whether and how the dried fish value chain provides

an adequate institutional setting for improving livelihoods and the environmental performance of aquaculture production (Loc et al., 2010).

In addition, VCA has been used to assess the competitiveness of the respective industry in that country's context. For example, Van Rooyen et al. (2002) used the VCA to assess competition in various food sectors, including wine, and the flower and horticultural sectors. In South Africa, Madevu (2007) mapped the local fresh produce chain to assess competition between informal vendors and formal retailers, wholesalers and supermarkets in the fresh produce sector. Other studies, sponsored by the United States Agency for International Development (USAID) in Cambodia and Indonesia, have used VCA as the diagnostic tool to identify opportunities and constraints to provide a basis for the needs of sectors when attempting to strengthen them (Ardjosoediro & Goetz, 2007; Peramune, 2010). Ardjosoediro and Goetz (2007) mapped the aquaculture value chain in Indonesia and were thus able to identify three targeted sub-sectors that provided comparative advantages for the respective sub-sectors. Jamandre et al. (2012) used VCA to assess performance and identify areas of improvements in the tilapia value chain in the Philippines.

Peramune (2010) used VCA in Cambodian aquaculture to identify the extent of the progress made, based on specific strategies, and to see if the strategic amendments made to the value chain had yielded the expected improvements in competitiveness. Past research (e.g. Bezemer & Headey, 2008; Muhanji et al., 2011) has studied input costs across the value chain levels to determine the profitability of fish farming as a venture. Identifying the key activities and analysing the value added relative to the cost involved in each stage of the value chain have significant implications for value chain participants as well as for the society.

Therefore, VCA helps to identify and link the activities and parties involved in the physical movement of aquatic products from farmers to consumers, thus determining the society's benefits while the strength of these backward and forward linkages helps to determine the magnitude of the improvement in communities and especially to farmers' livelihoods. As VCA helps to identify the contribution relative to the cost required for each value-adding activity involved in aquatic or fish marketing, it offers an opportunity to detect specific value chain activity that requires

more attention for improvement. This identification of value chain activity that needs improvement has great implications for value chain participants, such as individual farmers, suppliers and export firms as well as for the society. The detailed discussion on how to improve a value chain has been outlined below.

2.2.4 Improving a Value Chain

Value chain analysis (VCA) helps to overcome various weaknesses across different stages of the value chain and, thus, identifies the scope for further improvement of the existing value chain performance by focusing on the performance and cost involved at each stage. Improved performance throughout the value chain can be achieved both by the participants within the value chain itself and by those outside of it, that is, typically governments. Firms involved in the value chain can improve performance by reducing costs, increasing output and/or increasing the prices of their products (Riisgaard et al., 2010). The usual mechanism to improve a value chain is for each value chain participant to be more efficient at carrying out their respective role, and to improve the quality or form of the product with it being sold at a lower cost to the next link in the value chain. Improvements in value chain performance can also be supported by governments and other parties external to the value chain, such as non-governmental organizations (NGOs). Government policy, institutions and infrastructure all impact on the ability of businesses in the value chain to source the inputs that they need, to make or engage in their primary activity, and then to sell and deliver their product to their customers. Therefore, governments may have an influence on value chain performance through their guidance on policy, subsidies, licensing, standards, transport infrastructure and related costs (Macfadyen et al., 2012).

2.2.5 Governance Issues in the Value Chain

One of the key issues involved in VCA is the governance of the value chain. This refers to the authority and power relations that determine how financial, material and human resources are allocated and flow within the chain (Gereffi, 1994). It is related to which firms within the chain are most able to control various aspects of the production and distribution process and how they influence the distribution of the value thus created in each stage across the chain (Kaplinsky & Morris, 2001). It

involves the ability of one firm in the chain to influence or determine the activities of other firms in the chain.

Value chains are governed when parameters requiring product, process and logistics qualification are set which have consequences up or down the value chain encompassing bundles of activities, actors, roles and functions. Gereffi et al. (2005) argued in support of five different types of value chain governance, namely, the market value chain, the captive value chain, hierarchical vertical integration, the modular networked value chain and the relational value chain. Market-type governance involves the lowest degree of coordination among the participants or members of the chain, where the costs of switching to new partners are low for both parties. The captive value chain includes quasi-hierarchical relationships between powerful independent firms in the chain, where small suppliers are transactionally dependent on much larger buyers and face significant switching costs. The third type of governance is hierarchical vertical integration which is the highest degree of coordination (monitoring and control) between the firms within the chain. The fourth type of governance is the modular network type of value chain, where suppliers make products based on customers' specifications. Finally, relational value chains encompass a complex form of interactions between buyers and sellers which often creates mutual dependence and high levels of asset specificity. While these five different types of governance can be relevant for different types of industries, research focusing on which type of governance structure is suitable for the mud crab value chain is not available in the extant literature.

2.2.6 Research Gaps in Value Chain Analysis

The above discussion offers a brief account of the concept of the value chain, VCA across different industries and countries, and the usefulness of VCA specifically in achieving competitiveness, identifying the drawbacks for the chain members, and directing them towards improvements to the value chain. In addition, while past literature has shown adequate evidence in support of applying VCA for the improvement of various sectors, including aquatic products, improving the livelihood of poor fishers through VCA has to date received little or no attention. Furthermore, the earlier discussion highlights the relevant governance issues within the value chain which are important to address for the chain to operate smoothly. Although it is

evident that VCA in the aquatic value chain has received adequate attention from researchers, no research to date has focused on which type of governance structure is suitable for the mud crab value chain. Governance in the mud crab value chain is particularly important owing to its existing problems including the unfavourable dominance of crab suppliers over crab fishers, the low income and unsustainable livelihood of crab fishers, etc. (Zafar & Ahsan, 2006), with these problems discussed later in Section 2.3.1. Scholars have recognized that more attention is required to improve agricultural value chains to increase the quality-based competitiveness of domestic agricultural produce, thereby contributing to poverty alleviation of the farmers (FAO, 2014). Such improvement in the value chain is particularly important for the mud crab sector of Bangladesh as the mud crab fishers suffer from poverty and an unsustainable livelihood.

A well-functioning value chain in which actors mutually support each other can improve the competitiveness of the entire value chain, from the time the produce leaves the farm gate until it arrives in the hands of a satisfied consumer (Rich et al., 2011). Moreover, such mutual support among the value chain members can be ensured through an optimum governance system which is currently absent in the existing mud crab value chain. Consequently, this research attempts to find an optimum strategy (vertical integration vs introducing a cooperative) for improving the mud crab value chain and its governance (through the guiding philosophy of the social business concept) to ensure a sustainable livelihood for the crab fishers. Later in this chapter, this is discussed in further detail.

2.3 MUD CRAB VALUE CHAIN IN BANGLADESH

2.3.1 Present Status of the Mud Crab Value Chain

A typical value chain for mud crab in Bangladesh is long, unstructured and does not receive any government attention (Zafar & Ahsan, 2006). Numerous middlemen, such as *aratders* and depot owners, play a significant role in the distribution of mud crab (Chandra et al., 2012). Despite the growing export potential, a structured crab marketing system has not yet been established in Bangladesh (Zafar et al., 2004). Unfortunately, there is no structured crab value chain network established in Bangladesh (Zafar et al., 2004). From the review of the extant literature (Ferdoushi et al., 2010; Zafar et al., 2004), existing mud crab value chain is as shown in Figure 2.6.

From Figure 2.6, it is evident that the current distribution of mud crab comprises a series of intermediaries (no official figures) who operate between crab fishers and exporters or local retailers, but the literature focusing on the mud crab value chain from coastal Bangladesh is inadequate. Only a couple of studies (Ferdoushi et al., 2010; Zafar & Ahsan, 2006) have discussed the numerous drawbacks of the existing value chain which include crab fishers being trapped and exploited by *aratders* and/or depot owners; lack of bargaining power; lack of market information; lack of access to different livelihood assets, etc. all of which warrant mentioning. The *aratders* often exploit the crab fishers by paying advance money to the collectors in the lean season on the condition that the latter will sell their entire catch to the former at a certain price (significantly lower than the market price) that has been fixed earlier (Zafar & Ahsan, 2006).

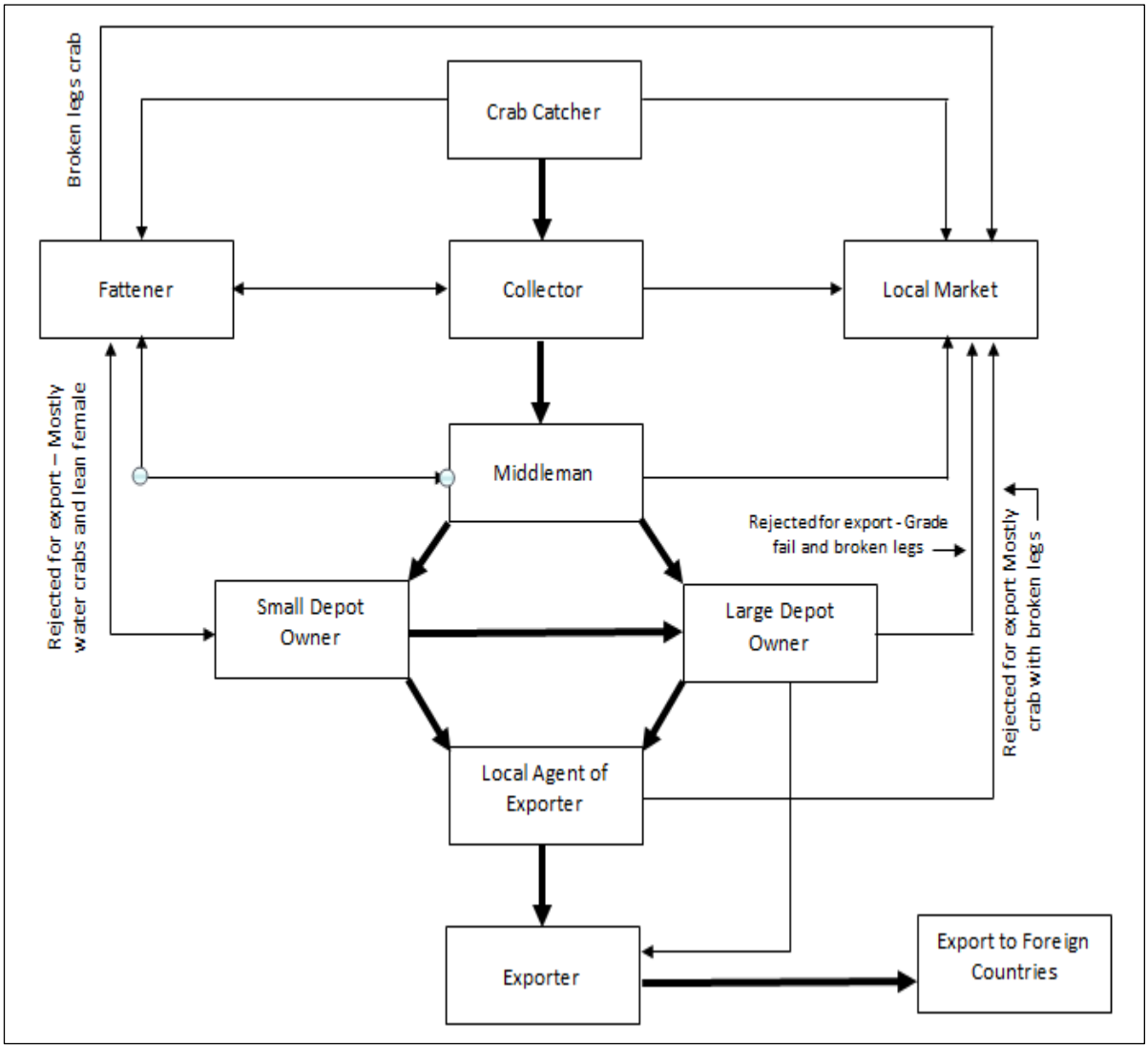


Figure 2.6: Distribution network of mud crab from coastal Bangladesh
(Source: Ferdoushi et al., 2010)

Researchers unanimously have mentioned that a typical mud crab value chain in Bangladesh is long, cumbersome and exploitative to crab fishers which is responsible for leaving their livelihood open to risk. Hence, the existing value chain needs to be revised (Ferdoushi et al., 2010).

2.3.2 Actors in the Mud Crab Value Chain in Bangladesh

Crab fishers: Crab fishers are the primary source of raw crabs in the value chain. They catch crabs from the sea or from the seashore, then carry their catch in baskets made from bamboo, and walk to the local village market to sell the crabs to either the crab collectors or to the crab suppliers. They also sell a tiny part of their catch, especially the smaller specimens, to the fattening center. Only a few crab fishers have their own boat and most depend on large fish merchants' boats to catch crabs. Most crab fishers are poor.

Crab collectors: Crab collectors often collect crabs from the crab fishers. They are primarily found in the south-western part (Khulna division) of the country. Crab collectors are the local traders (often locally termed as *forias*) who buy crab from the crab fishers and sell them to the crab suppliers. *Forias* are petty traders operating with small capital and a smaller volume of business compared to other intermediaries. They generally sell products to the *aratdars* (crab suppliers). At times, they work as the agents of *aratdars* or *mahajans* (merchants or suppliers) to buy from the crab fishers on a commission basis. Crab collectors are mostly from poor fishing communities and collect not only crabs but also molluscs, shells, etc. In specific months of the year, a ban on crab collection usually applies but often this is not followed. In the off-season, the poor crab collectors have few livelihood opportunities. Some crab collectors, however, manage to switch to the fishing profession or shrimp fry collection or agricultural wage earning.

Crab suppliers: Crab suppliers are often locally called *aratders*. They are the dominant group in the value chain. Large fish traders many have their own boats, gear and depots for storing raw crabs. They also organize trips in the sea to catch fish, crabs and other aquatic products. In addition, they are money lenders in the sense that they offer loans (*dadons*) to agents, that is, to crab collectors and crab fishers. The crab suppliers are the most powerful group of actors in the mud crab

value chain, controlling the collection and marketing of crab from the rural coastal area.

Exporters and exporters' agents: Exporters are usually located in city areas and run their businesses with crab suppliers through local agents. They are the most powerful participants in the crab value chain. Exporters purchase the crabs from local agents who transport the crabs to the capital city to the exporters' final destinations for export purposes.

Others: In addition to the above-mentioned participants, the crab value chain may also involve a few other minor value chain participants based in certain coastal areas of Bangladesh. Such participants are the *bepari* (professional trader), *majhi* (boatman) and *mahajan* (supplier). *Beparis* are professional traders like *aratders.* They buy a large quantity of the crabs from collectors (or *forias*), and sell directly or through the suppliers. The *majhi* is a boatman who operates the boat to collect crabs and fish from the deep sea. At times, the group of collectors is led by one *majhi* (boatman) who is contracted for the harvest by the *mahajans* or *aratdars*. *Mahajans* are like merchants or suppliers and often are also money lenders.

2.3.3 Mud Crab Value Chain Analysis using Porter's Model

The crab value chain includes both primary and support activities. Primary activities of a crab value chain comprise crab catching, sorting, grading, cleaning, packaging and transporting, whereas support activities comprise different support services ranging from crab catching to selling crab to crab exporters' agents. These support services include crab catching tools such as nets, gear, watercraft, boats, trawlers, etc. with which the fishers catch fish; human resource services such as crab fishers, their family members, etc.; infrastructural services such as the fishers' home yard or backyard of their home, etc. which are used for preserving the crabs (Rabbanee et al., 2012). The VCA of the present mud crab value chain using Porter's model is shown below in Figure 2.7 (which has been developed for this research).

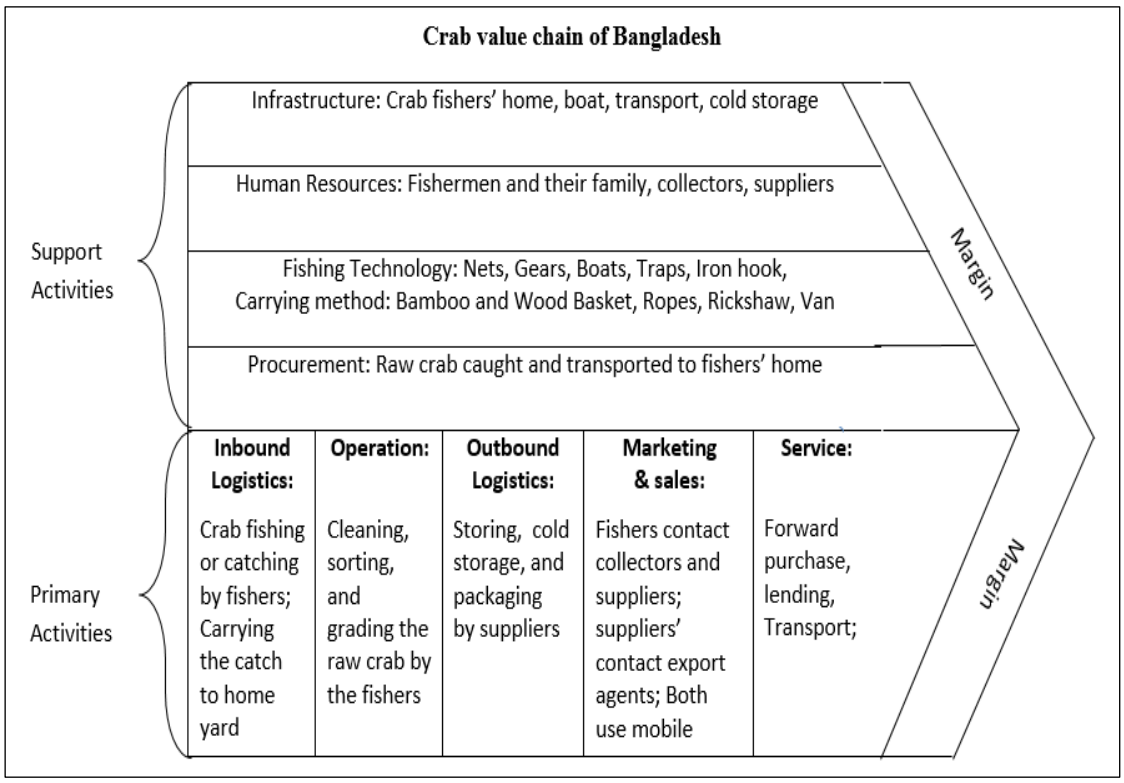


Figure 2.7: Mud crab value chain analysis using Porter's model

2.3.4 Analysing Activities across the Mud Crab Value Chain

Based on the existing literature (Zafar & Ahsan, 2006; Ferdoushi et al., 2010), the activities of the existing mud crab value chain in terms of participants, their activities, livelihood conditions, input resources, income and constraints are summarized and shown in Table 2.1 below.

Table 2.1: Summary of activities (based on value chain analysis) of existing mud crab value chain

Particulars	Inbound Logistics	Operations	Outbound Logistics	Marketing and Sales	Services
Primary Activities	Crab fishing or catching by fishers; carrying the catch to home yard	Cleaning, sorting and grading the raw crab by the fishers	Storing, cold storage and packaging by suppliers	Fishers contact collectors and suppliers; suppliers contact exporters' agents	Forward purchase, lending money, transport such as rickshaw

Support Activities	Crab carrying using bamboo basket to fishers' home yard through human pedalled rickshaw, human pedalled van, etc.	Tying the crab claws with ropes	Weighing and labelling, making bamboo basket by the fishers' family members	Both fishers and suppliers using mobile phones to contact their buyer	Storage facility

2.3.5 Problems of the Existing Mud Crab Value Chain

Mud crab collection is done by the coastal population, the most marginalized segment of the population comprising landless people, widows, orphans and children, for their livelihood with collection fluctuating seasonally as does their income (Zafar & Ahsan, 2006). The crab sector provides the livelihood of millions of poor fishers, traders, transporters and exporters (Molla et al., 2009; Zafar, 2004). They are usually exploited by the *aratders/forias* (Ferdoushi et al., 2010) and most of the profit goes to the *aratders*, crab traders and exporters (Chandra et al., 2012). Despite the growing export potential and the great market demand, no structured crab marketing system has yet been established in Bangladesh (Zafar & Ahsan, 2006). The drawbacks include: price fluctuations, illiteracy, lack of market knowledge, small domestic market, less market intelligence, absence of a government information recording system, poor bargaining power of fishers, lack of access to institutional credit, high mortality, poor storage facility locally and poor transportation. All of these existing drawbacks make the situation more vulnerable for the crab fishers and for the total crab marketing system (Ferdoushi et al., 2010). Crab fishery has grown in Bangladesh without any government support (Khan & Farukul, 1991). It is imperative for the Bangladesh government to take initiatives to reassure crab fishers and look after their socio-economic growth by helping them to develop production and trade at a sustainable level. It is also essential to study the resources and the population dynamics to preserve and manage the crab resource.

Zafar and Ahsan (2006) also mentioned that low returns for crab fishers in Bangladesh appeared to be related to the lack of a live preservation technique as well as their lack of bargaining power in the marketing channel. In addition, the reasons for less value adding at the small-scale producer level were presumed to be the lack of market access due to various institutional and non-institutional barriers, for example, high transportation costs, illegal tolls, taxation and prices between producers and consumers that were exploitative of market players (Zafar & Ahsan, 2006). In addition, a growing locational gap exists between crab fishers, suppliers and exporters. For the crab fishers to earn a consistent income, the locational gap needs to be narrowed down, with this requiring institutional intervention to achieve vertical integration between the crab value chain members. Improvements also need to be made to the knowledge of post-harvest activities, including all aspects of marketing and marketing channels (Zafar & Ahsan, 2006).

2.4 REVISING EXISTING MUD CRAB VALUE CHAIN: INTRODUCING THE COOPERATIVE AND VERTICAL INTEGRATION

Considering that the existing mud crab value chain is long, complex and unable to ensure livelihood security for the crab fishers, it needs to be rethought and/or revised. With this backdrop, the researcher proposes to introduce a cooperative into the existing mud crab value chain. A cooperative and mutually beneficial value chain partnership has become a high priority for organizations to achieve better performance (Lambert & Cooper, 2000; Wisner & Tan, 2000; Hvolby et al., 2007). Cooperatives have also been successfully implemented in the fishery sector as an appropriate arrangement for future fisheries management systems (Nielsen et al., 2004). In the current research, the primary purpose of introducing a cooperative is to reduce the number of stages in the existing value chain, to ensure a fair price for the mud crab fishers for their produce and, thus, to ensure their livelihood security. A cooperative will integrate three stages, namely, the crab collectors, *aratders/forias* and depot owners, in the existing value chain. The cooperative will ensure that this integration will result in offering the services, currently offered separately by these value chain participants, in a more coordinated manner. The proposed value chain based on a cooperative is shown below in Figure 2.8.

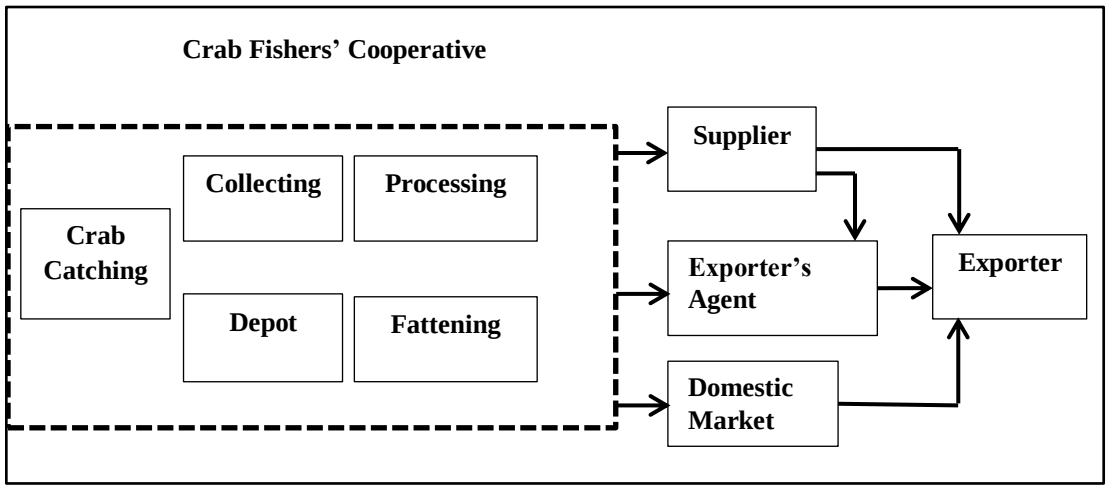


Figure 2.8: Proposed mud crab value chain based on a cooperative

A cooperative, often termed 'co-management', is the sharing of management authority and responsibility between two or more agencies or identifiable elements of the community of users (Pinkerton, 1989). A cooperative has gained increasing acceptance among governments, development agencies and researchers as an appropriate arrangement of fisheries management systems (Nielsen et al., 2004). However, literature has documented evidence of both successful and unsuccessful stories of cooperatives in fisheries and coastal resource management (Pomeroy et al., 2001). With this backdrop, current research advocates for introduction of a cooperative in the mud crab value chain in Bangladesh due to the immense potential of a cooperative from the social business (Yunus et al., 2010) perspective. The introduction of a cooperative is aimed at solving the crab fishers' livelihood problems by integrating current value chain participants under one umbrella.

2.4.1 Vertical Integration in the Value Chain

A firm vertically integrates its value chain stages to lower its transaction cost (Williamson, 1975) and, thus, to improve its performance (Harrigan, 1985). Research has shown that vertical integration enables the attainment of market power (Hastings & Gilbert, 2005; Normann, 2009) and influences the price and quality of the final product (e.g. Arya et al., 2008; Matsubayashi, 2007). Vertical integration across the value chain offers numerous other benefits such as building entry barriers, facilitating investments in specialized assets, protecting product quality and improving scheduling and coordination (Harrigan, 1985; Rothaermel et al., 2006;

Williamson, 1975). Considering the above-mentioned benefits, vertical integration can be said to be one of the best ways to obtain efficiency in the value chain (Bagchi et al., 2005). As the existing mud crab value chain is long and dominated by middlemen who have a negative impact on its performance, the number of channel levels could be reduced through vertical integration to reduce the costs of distribution and to enhance the value chain's performance. Thus, one way to improve the existing mud crab value chain is to reduce the number of channel levels with this able to be attained through vertically integrating the channel members.

2.4.2 The Cooperative in the Value Chain

As previously mentioned, in the fishery sector, the cooperative has gained increasing acceptance among governments, development agencies and researchers as an appropriate arrangement of future fisheries management systems (Nielsen et al., 2004). The cooperative enables collective participation of all the related stakeholders in managing and operating the entity based on the principles of cooperation rather than competition. These collective actions enable increased vertical integration in the value chain and result in improved marketing capacity (Kaganzi et al., 2009; Komarudin et al., 2007; Paumgarten et al., 2012). Co-management (another term for cooperative) is a proven tool to reduce the high transaction costs associated with fisheries management (Scott, 1993; Pearse & Wilson, 1999) and to improve the bargaining position of small farmers (or fishers) (Roy & Thorat, 2008; Fischer & Qaim, 2012). Gurung et al. (2005) provided evidence that participatory fishery management practices substantially improved the livelihood of fishers' community in Nepal. The cooperative has also been proved to be effective in fishery management in Japan (Shima, 1983; Jentoft, 1989) and in Turkey (Berkes, 1986; Jentoft, 1989).

2.5 SUSTAINABLE LIVELIHOOD

The term 'livelihood' means the way of living but it is not only the net result in terms of income received or consumption attained (Ellis, 2000). It is linked with social and human factors and comprises the capabilities, assets and activities required for the means of living (Chambers & Conway, 1992). A sustainable livelihood is one which is able to cope with challenges, recover from stresses and maintain or enhance its capabilities and assets both now and in the future without undermining natural

resources (DFID, 1999; Chambers & Conway, 1992). A sustainable livelihood ensures the ability of men and women to utilize asset portfolios on both a short-term and a long-term basis, enabling adaptive and coping strategies, economic effectiveness, social equity and ecological soundness (UNDP, 2000). Scoones (1998) mentioned five key indicators which are important for assessing the achievement of sustainable livelihoods: (a) poverty reduction; (b) well-being and capabilities; (c) livelihood adaptation; (d) vulnerability and resilience; and (e) natural resource base protection. The UK Department for International Development (DFID)'s sustainable livelihood framework (DFID, 1999) helps with holistic thinking about the factors that contribute to the vulnerability of the poor in relation to the assets and resources that help them to thrive and survive, and the policies and institutions that impact on their livelihoods (see Figure 2.9). The DFID model emphasizes that although the centre-point of the sustainable livelihood framework is the 'asset base' (i.e. financial capital, physical capital, social capital, human capital and natural capital), these asset bases are interconnected and influenced by two factors, namely, the vulnerability context and the structure and process which are the determinant factors of people's livelihood options. These asset or capital bases are essential in removing the vulnerabilities exposed in people's livelihoods that arise from shocks, trends and seasonality. Once they possess the essential livelihood capital/assets, they are able to receive the livelihood outcomes in terms of more income, security, etc.

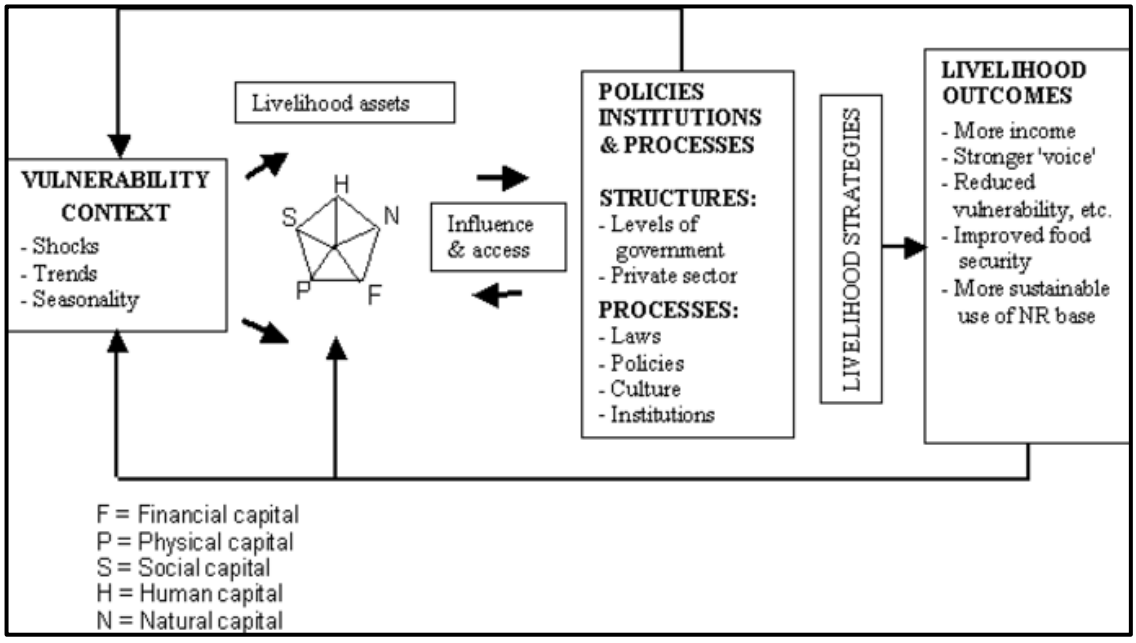


Figure 2.9: DFID model of sustainable livelihood (Source: DFID, 1999)
Note: NR= natural resources

2.5.1 Sustainable Livelihood of Crab Fishers

As discussed earlier, the crab fishers of Bangladesh are poor and have an unsustainable livelihood for numerous reasons, such as the lack of effective government support, dominance of the suppliers, absence of formal loans for crab fishers, lack of adequate market information that is useful for crab fishers, etc. The current research, through VCA of the mud crab sector aims to propose a new mud crab value chain to ensure the sustainable livelihood of the crab fishers. The next section provides details describing a sustainable livelihood.

2.5.2 The Cooperative and Sustainable Livelihood of Crab Fishers

Several linkage activities, such as hatcheries, fattening centres, depots for storing and transporting, etc. are connected to the mud crab fishery in the value chain that offers opportunities to absorb community and/or family members' labour and provide income for everyone in the family or in the community (Lewis et al., 1993; 1996). This opportunity eventually leads the fishers towards attaining a sustainable livelihood. Past research has shown that community-based mud crab fishery has the potential to improve the livelihood of coastal communities provided that community members have a vision of helping each other and the entire community (Mirera et al., 2014), with this often called 'cooperative co-management'. Clear market outlets, better prices for mud crabs, etc. can be attained by communities through an appropriate policy and governance structure for running the cooperative for the mutual benefits of its community members. Thus, to ensure a sustainable livelihood for the fishers, the cooperative needs to be governed in a participatory manner. The governance of the cooperative in a value chain is next discussed.

2.5.3 Governance of the Cooperative in the Value Chain

Although the extant literature provides some success stories of cooperatives in the fishery value chain, the launching of a cooperative in the mud crab value chain is not readily at hand. Instead, it depends on numerous factors such as governance issues, that means, who will run the cooperative, whether the cooperative will be adopted by the value chain members, etc. The governance issues relating to a cooperative in the value chain are discussed below.

The concept of governance in the value chain was first coined by Gereffi (1994) who defined governance as "authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain" (Gereffi, 1994, p. 97). Research on governance issues in the value chain has focused on the power relationship which does not necessarily mean the subjugation of one party over another within the value chain. Instead, it is expressed in terms of better coordination of the activities along the chain, such as the integration of activities, outsourcing, just-in-time delivery, etc. Therefore, governance is defined as the relationships between the participant firms in the value chain and the institutional mechanisms through which coordination of activities in the value chain takes place (Humphrey & Schmitz, 2002). The participant member who holds the governing power or authority usually captures the greater value added along the chain. Governance is achieved through setting and enforcing relevant operational decisions relating to the product (e.g. what is to be produced?) and the process (e.g. how is it to be produced?) parameters that will be met by the value chain participants (Humphrey & Schmitz, 2002).

2.5.4 Cooperative vs Vertical Integration in Mud Crab Context of Bangladesh

Although vertical integration and introducing a cooperative are proven ways of improving an existing value chain, neither has been assessed in the mud crab sector of Bangladesh. As mentioned before, vertical integration enables the reduction of channel levels and the attainment of market power, and contributes to the end-price of the finished product (Arya et al., 2008; Normann, 2009). However, vertical integration may not ensure a fair price at the harvesters' (crab fishers') level and, thus, may not be able to contribute to ensuring their sustainable livelihood. On the other hand, the cooperative has already proved to be an appropriate arrangement for fisheries management in South Asian countries (Gurung et al., 2005). The cooperative can be considered the ideal remedy in this research context as it will encompass vertical integration of channel levels as well as being operated based on membership and the principles of cooperation (Jentoft, 1989) instead of those of competition. This will help to ensure a fair price for the crab fishers and will break the exploitation trap. Such cooperation and/or co-management have been successfully introduced in fishery distribution channels in many developing countries

in Asia (Pomeroy, 1995; Pomeroy et al., 2001). Furthermore, considering that the cooperative is a community institution facilitating co-management and participation of all related stakeholders (Zafar & Ahsan, 2006), its operation and governing principles can be developed based on social business principles. This will enable the cooperative to run with the aim of dealing with a specific social issue (in this context, ensuring a sustainable livelihood for the crab fishers). Therefore, this study posits the introduction of a cooperative in the mud crab value chain in Bangladesh with the aim of enhancing the marginalized crab fishers' sustainable livelihood by integrating existing value chain participants under one umbrella. To be specific, the cooperative will integrate three channel levels—crab collectors, *aratders*/*forias* and depot owners—in the existing value chain. Table 2.2 (developed for this research) focuses on an analysis of the role of the cooperative in the mud crab value chain in terms of the participants, their activities, livelihood conditions, input resources and income.

Table 2.2: Role of cooperative in the mud crab value chain

(Developed for this research)

Particulars	**Harvesting**	**Wholesaling/ Processing**	**Selling/ Transporting**	**Retailing**
Participants	Crab fishers	Local crab cooperative	Exporter's agent	Exporter; domestic retailer
Activities	1. A more planned and organized fishing trip. 2. Ensure sustainability of the natural environment while fishing. 3. Sell to local cooperatives instead of middlemen. 4. Obtain higher price than the conventional system. 5. Eliminate exploitation and obtain growth.	1. Ensure fair price for crab fishers. 2. Assist crab fishers with financing and providing physical resources. 3. Storing (cold storage). 4. Standardization and grading. 5. Generate employment for marginalized women. 6. Training (post-harvest utilization and other training). 7. Provide market	1. Purchase from cooperatives. 2. Able to buy high quality crab with varied grades. 3. Buy processed crab meat with labelling and packaging. 4. Safe transport to the capital for exporting.	1. Ensure more specialized and differentiated crabs in live, frozen, fry, cooked as meat, cake, etc. 2. Access to broader market both home (specialized area such tourist spot, diplomatic zone, etc.) and abroad. 3. Domestic retailer can offer quality crab in local market.

		information. 8. Vertical integration (backward and forward). 9. Specialized processing unit for crab meat. 10. Branding and traceability – ready to cook, ready to eat.		
Inputs: (Physical resources)	Assistance from cooperative – both financial and physical resources.	Arranging financial resources, physical resources, storage facilities, transport facilities, etc.	Transport materials.	Finished crab products.
Contribution	Key raw materials sourcing group; ensure quality produce while considering seasonality effect in a planned manner.	Ensure social welfare by assuring fair price for crab fishers, by offering training to them, and by equipping them with better technology. This will also ensure a better livelihood for the fishers as well as making them capable of facing challenges arising from natural disasters. Encourage crab fattening.	Established crab business with structured value chain.	Exporters can earn more foreign currency through creating and offering vast amounts of specialized crab for consumers in foreign markets.
Income	Income should be increased.	Key purpose is to ensure equity for all the parties involved and to earn profit.	Will be able to receive quality produce which may help them earn more money.	Will be able to receive quality produce which may help them to earn more currency.

2.6 THEORETICAL BACKGROUND

2.6.1 Social Business

Nobel Laureate Professor Muhammed Yunus is the key proponent of the social business concept (Yunus, 2009). Social business is a non-loss, non-dividend and self-sustaining company. Its primary purpose is to serve the society by focusing on a specific social issue (a problem) and solving it through entrepreneurial efforts. It is not a charity; rather, it is a business with products, services, customers, markets, expenses and revenues, etc. like any other regular enterprise. The key difference between a social business and a conventional business is that a social business is more a cause-driven effort than one that is profit-driven. The owners are entitled to recover their invested money but they are not entitled to take any dividend (Yunus et al., 2010). Instead, the profit of the social enterprise is used for expansion of the business as its next target is to solve another social problem.

Unlike the conventional business, the social business focuses on a non-profit, non-charity, social motive with the business model guided by novel value proposition/value constellation combinations. Yunus et al. (2010) pointed out five lessons from existing social business experiences which show the clear distinctions between the social business model and the conventional business model. These lessons are: (i) challenging conventional wisdom; (ii) finding complementary partners; (iii) undertaking continuous experimentation; (iv) favouring social profit-oriented shareholders; and (v) clearly specifying social profit objectives. Motivated by the social business experiences of Professor Muhammed Yunus, our target was to ensure a sustainable livelihood for the millions of poor coastal crab fishers of Bangladesh by introducing a mud crab cooperative in the existing complex value chain. As discussed earlier, value chain analysis (VCA) has not previously been studied to improve the livelihood conditions of crab fishers. Moreover, this research posits the revision of the mud crab value chain by launching a fishers' cooperative in the crab value chain, with governance of the cooperative a huge issue, to become successful in ensuring a sustainable livelihood for the crab fishers. Furthermore, nothing was found in the literature that explains how the social business concept can be applied in the value chain context of aquatic products, in general, and mud crab, in particular. Hence, the researcher has attempted to explain the possible role and

governance of the proposed fishers' cooperative in the mud crab value chain from the social business point of view.

2.6.1.1 Social business as the governing philosophy for a cooperative

Yunus and Weber (2010) mentioned that the social business can be developed in various sectors in the rural economy, including fishery management, to safeguard the prosperity of rural communities in a sustainable way. Based on the concept of the social business, this research posits the establishment of a social enterprise in the mud crab value chain, which will be considered as a business hub. Motivated by the five social business principles (viz: challenging conventional wisdom, finding complementary partners, undertaking continuous experimentation, favouring social profit-oriented shareholders and clearly specifying social profit objectives) (Yunus et al., 2010), this study explores how to ensure a sustainable livelihood for the millions of poor coastal crab fishers of Bangladesh by introducing a social enterprise in the existing complex value chain. The key purpose of this social enterprise is to solve the livelihood problems of mud crab fishers and other participants, rather than to earn profit. As the purpose of this research is to improve the existing mud crab value chain to enhance a sustainable livelihood for crab fishers, establishing a social enterprise should be in line with the literature in relation to the ways of improving a value chain. The existing literature suggests two alternative ways to improve a value chain - vertical integration and introducing a cooperative (Zafar & Ahsan, 2006) in the value chain.

Therefore, the proposed mud crab value chain has a cooperative as the central point of the chain. The cooperative would be a social enterprise guided by social business principles with the aim of enhancing the sustainable livelihood of crab fishers. It would reduce the number of stages in the existing value chain (integrating three stages—crab collectors, *aratders*/*forias* and depot owners), ensure a fair price to the mud crab fishers for their produce and, thus, ensure their livelihood security. The cooperative would ensure that the integration of the channel levels would result in offering the services (currently separately offered in these three stages by these value chain participants) in a more coordinated manner. However, it is necessary for the proposed value chain to be evaluated before its formal introduction.

2.6.1.2 Analysing the mud crab value chain from the social business perspective

We conceptualize the role of a cooperative in the mud crab value chain guided by the five lessons pointed out by Yunus et al. (2010). Table 2.3 (developed for this research) summarizes the roles of a cooperative in the mud crab value chain from the social business point of view.

Table 2.3: Comparison of proposed mud crab value chain with the social business view (developed for this research)

Social Business Lessons	Proposed Value Chain
1. Challenging conventional wisdom: **Key Theme:** It will question the existing rules of the competitive game of a specific sector or industry to transform its fundamental references. Thus, the organizations will adopt new rules of doing business by focusing on double-loop learning. Here double-loop learning forces the organization to alter its ultimate references and adopt innovative ones.	The proposed value chain challenges the conventional value chain by introducing a 'crab cooperative' (a local mud crab association) and reducing the role of *aratders*. **Value proposition**: Harvesting mud crab from coastal areas in a more efficient and sustainable way; integrating the value chain participants; and ensuring livelihood security for the crab fishers as well as sustainability of the natural resources. **Value constellation:** The cooperative will provide financial support by lending money to the crab fishers at a minimum interest rate. It will also have sufficient stock of different physical facilities, such as fishing gear, small boats, traps, etc. for lending to the crab fishers. Thus, the cooperative will rescue the fishers from the exploitation that they currently experience from the *aratders / dadondars*, who are also middlemen for crab marketing. **Profit Equation:** The cooperative will not be profit-centric. Instead, its key motive will be to ensure social well-being and a sustainable livelihood for the crab fishers by ensuring a fair price for their crabs and by generating alternative income for the female family members of the fishers. The cooperative will ***vertically integrate*** the role of collectors, *aratders* and depot owners under one umbrella, helping to eliminate the extent of the exploitation currently faced by the marginalized fishers.
2. Finding complementary	To work under the cooperative paradigm, the crab fishers and all the middlemen will become members of the crab

partners **Key Theme:** In the social business model, the parties involved in the system will act under the cooperative paradigm instead of the conventional competitive paradigm. Hence, it is necessary to seek complementary partners and to leverage their expertise and resources by setting up partnerships.	cooperative (the local crab association). The cooperative can also build partnerships with the local fish depot or storage centres to access their facilities for preservation and quality storage. The current marginalized crab fishers can benefit from the proposed value chain if the exploitation trap of the existing middlemen can be cracked. This would be possible if the fishers could be empowered by making them members of the cooperative, and having them sell their catch to the cooperative instead of selling to the *aratders* at a low price. Therefore, the primary motive of the cooperative is to leverage expertise and resources by setting up value-added partnerships between the parties involved. Mutually beneficial relationships would be established with numerous industry organizations, such as the transport industry, jute and bamboo industries, plastics industry, fishery industry, supermarkets, etc. to achieve smooth operation and better control and to create a domestic market.
3. Undertaking continuous experimentation **Key Theme:** To acquire the knowledge to make the required changes in doing business, the social business model conducts a series of small experiments to minimize risk and maximize learning. It involves ability and intention rather than intuition to make changes if the first effort turns out to be unsuccessful.	Possible examples of continuous experiments with the cooperative under the social business model are as follows: • Take crab collectors or middlemen as working manpower for cooperatives, with different job responsibilities. • Collect a small boat, trawler, gear and/or traps from different crab collectors for a certain time on a rental basis to lend these resources to the crab fishers. • Engage the middlemen, crab fishers or poor women (i.e. family members of the crab fishers) in different types of packaging for processed crab meat. • Engage people to make different types of bamboo baskets and net pots for the purpose of safe transportation. • Extend the network of the supply chain step-by-step and establish more cooperatives in each region. • Introduce a new specialized department for crab meat processing with varied differentiation in product offerings under ready-to-eat and/or ready-to-cook traceable labelling. This will ensure employment, especially for women. • Offer different training programs especially on the post-harvest utilization of crab; processing and storing raw crab and crab meat; skilled ways of fishing, crab culture or farming; environmentally-friendly fishing techniques, etc.

	• Offer up-to-date market information, details on customer demand and related other information. • Establish a code of best practices for crab fishing. • Undertake infrastructure development, such as establishing more ice plants in rural areas. • Establish a research centre and offer vocational training to rural people. • Motivate marginalized fishers to establish crab culture. • Create alternative income for family members of the crab catchers, especially for the females, by establishing a crab meat processing centre in rural areas, with this adding to the above measures to improve the financial conditions of crab fishers.
4. Favouring social profit-oriented shareholders **Key Theme:** The social business model should link with shareholders who understand and accept the social mission and believe that the costs incurred in social welfare will turn into cash flow in the medium or long term.	Under the proposed value chain with the cooperative in place, members will become shareholders of the cooperative. This will motivate members to cooperate with each other for the sake of generating profit for the crab cooperative as a whole. Hence, the cooperation among members (instead of previous competitive efforts) will ensure the social welfare of all involved parties. The proposed value chain (with the crab cooperative) will offer job opportunities for all related parties such as crab fishers, collectors, middlemen, depot owners and family members of the crab fishers, which will also help to offset their potential resistance through presenting a win–win situation. Thus, resistance from the existing value chain members could be handled by offering them training and motivating them to cooperate. The role of government (local government) could be crucial in introducing the proposed value chain with the establishment of the crab cooperative.
5. Clearly specifying social profit objectives **Key Theme:** The cooperation among partners may uncover conflicts over time. Hence,	To ensure the social well-being of the parties involved, the objectives of the crab cooperative might include the following: **Objectives:** • To sustain the livelihood of mud crab fishers by reducing exploitation and generating income opportunities for local people, especially for women; • To alleviate poverty through structuring a unique business entity/industry for increased foreign earnings

the key purpose of the social business (generating social profit instead of generating financial profit) should be clearly specified and the mindset of the shareholders should accordingly comply with the objective of the business.	and growth. • To offer training programs including post-harvest handling, harvesting techniques to reduce crab mortality rate, and measures to save the environment. • To be able to recover the invested cost by ensuring that the cooperative is economically viable. • To conduct research activities to improve crab culture, site selection, production stages, etc. by establishing liaison with different universities and the Marine Fisheries Academy. • To create alternative sources of income generation for female family members of the value chain participants, especially the crab fishers. by engaging the currently underutilized female workforce in preparing bamboo baskets for transporting fish/crabs, processing the crab meat, etc.

2.6.2 Factors Influencing Attitude towards Adoption of a Cooperative

Any new value chain must be evaluated in order to assess its acceptability to the stakeholders. A value chain can be assessed in different ways. Sharma and Christie (2010) assessed the performance of a hospitality industry value chain by evaluating the sequential primary and support activities using both qualitative observations and assessment of field-surveyed quantifiable indices. In the context of aquaculture, the existing research has primarily focused on calculating costs, earnings and percentages of value added at each stage of the value chain in order to assess its performance (Macfadyen et al., 2012; Loc et al., 2010). However, past research on aquaculture has not focused on behavioural aspects when assessing a value chain, although this assessment is necessary to discover stakeholders' opinions about its acceptability. The current research focuses on the acceptability of a cooperative as it is the key organizational entity in the proposed value chain, which will integrate three stages: crab collectors, *aratders/forias* and depot owners of existing chain. To test if a cooperative is acceptable, the study aims to explore factors that influence the intention of the existing channel members and other stakeholders to be engaged with a cooperative based new mud crab value chain. The phenomenon of accepting an innovation is widely supported by the theory of planned behaviour (TPB) and the diffusion of innovation (DOI) theory which are discussed next.

2.6.2.1 Theory of Planned Behaviour and Diffusion of Innovation (DOI) Theory

As mentioned above, the intention of the existing channel members to engage with the mud crab cooperative can be justified through the theory of planned behaviour (TPB) (Ajzen & Fishbein, 1980) and the diffusion of innovation (DOI) theory (Rogers, 1995).

The TPB is one of the most influential theories in explaining and predicting behaviour. It is an extension of the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980). According to the TRA, behaviour is determined by behavioural intention which, in turn, is determined by attitude and the subjective norm. Attitude captures a person's overall evaluation of performing the behaviour. Subjective norm refers to a person's perception of the expectations of important others about that specific behaviour. Recognizing that most human behaviours are subject to obstacles, Ajzen (1991) introduced the TPB, which generalizes the TRA by adding a third perception, that of perceived behavioural control (PBCL). The latter term, PBC, refers to a set of control beliefs and their perceived power over the performance of that behaviour. Thus, the actual behaviour of an individual depends on his/her intention to behave in the same manner, with this intention formed based on the attitude towards the object, the subjective norm and perceived behavioural control (PBCL). In a similar vein, the intention to be engaged with a mud crab cooperative will depend on the attitude of the channel members towards that cooperative. This attitude will be formed based on channel members' beliefs and/or feelings of the perceived benefits of and perceived barriers to adopting the cooperative. The study proposes that the perceived benefits and barriers of being engaged with a cooperative will be influenced by two key factors: individual (personal) factors and channel factors.

While channel members' intention to engage with the cooperative is explained by the TPB, the adoption of the cooperative is influenced by the DOI theory (Rogers, 1995). The DOI paradigm explains and predicts the influence of a wide range of factors on innovation adoption and implementation. These influencing factors include the social system (individuals, i.e. the targeted adopters, their peers, family members, etc.); the perceived nature of the innovation, such as its advantages, complexity and compatibility; and formal and informal communication between

individuals in relation to the innovation (Russell & Hoag, 2004). Thus, the DOI theory focuses on the diffusion process of an innovation, whereas the TPB explains the relationship between user attitudes, perceptions, beliefs and actual use. Notably, the ultimate purpose of this study is to ensure a sustainable livelihood for the marginalized mud crab fishers.

The study proposes that the sustainable livelihood of the crab fishers can be ensured by adopting a cooperative in the value chain for the distribution of mud crab from coastal Bangladesh. This can also be supported by the TPB as, according to Ajzen (1991), the stronger the intention to engage in a specific behaviour, the more likely is its performance. Guided by the TPB, this study proposes a conceptual behavioural model reflecting the relevant variables, such as benefits and barriers of a cooperative, that are likely to influence the intention of existing channel members to be engaged with that cooperative, with this discussed next.

Taking into consideration that the existing mud crab value chain threatens the livelihood of mud crab fishers and is causing a social problem in rural coastal Bangladesh, this research borrows the concept of the social business model to develop and run the fishers' cooperative within the proposed mud crab value chain to enrich the livelihood of the crab fishers.

2.7 PRELIMINARY RESEARCH MODEL

Guided by the existing literature and relevant theories such as the TPB (Ajzen, 1991), the TRA (Ajzen & Fishbein, 1980) and the DOI theory (Rogers, 1995), the researcher proposes a behavioural model (Figure 2.10). The model focuses on the factors affecting the adoption of a cooperative in the existing mud crab value chain and posits that the adoption of the cooperative will lead to a sustainable livelihood, as perceived by the mud crab value chain participants. The proposed model is shown in Figure 2.10.

The model starts with the key factors (individual factors and channel factors) that determine the existing channel members' intention to engage with the cooperative in the mud crab value chain. This is followed by numerous other factors that may act as intervening (perceived benefits of the cooperative and perceived barriers to adopting the cooperative) and dependent variables (intention to adopt the

cooperative and sustainable livelihood of the crab fishers). The following discussion focuses on the various factors and variables of the behavioural model and their theoretical relevance.

Individual factors: Individual factors represent the individual's positive or negative evaluation of performing the behaviour. Individual characteristics and/or differences are important factors in explaining/predicting the adoption of innovations (Xu & Quaddus, 2007). Past studies (e.g. Xu & Quaddus, 2012) on innovation adoption have widely indicated that the individual or end-user characteristics or differences are important factors in predicting the adoption of an innovation. Individual factors include *knowledge of the channel members*, their *extent of involvement* in the crab business activities, and the nature of their *roles and responsibilities* in the existing mud crab value chain.

Channel factors: Channel factors refer to factors inherent among the distribution channel members and characterize the salient features of the existing channel members. Channel factors comprise quality of *communication between the channel members*, and their *cooperative attitude* and *commitment* towards change**.** Past studies (e.g., Kim, 2000; Benton & Maloni, 2005) have shown separate empirical evidence for each of these factors influencing the performance of channel members as well as their adoption of an innovation.

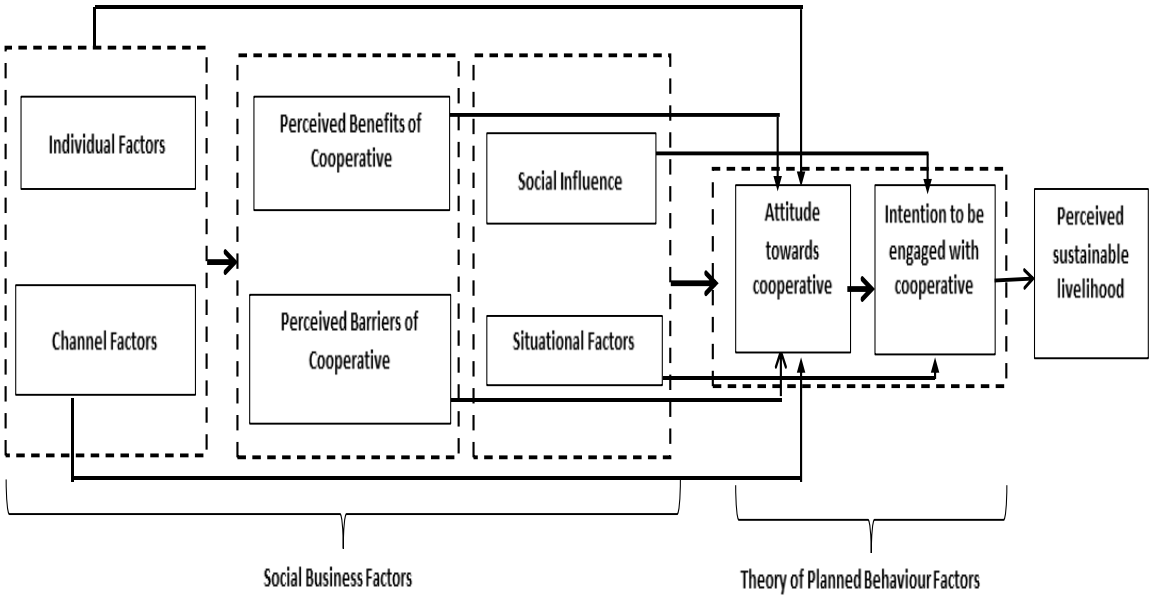


Figure 2.10: Proposed initial research model based on the literature

Perceived benefits of a cooperative: Perceived benefits refer to the key attributes of the cooperative that induce its adoption (Roger, 1995). Perceived benefits include three variables: relative advantage, compatibility and complexity that are highly related to innovation adoption (Quaddus & Hofmeyer, 2007). The perceived benefits of a cooperative comprise the relative advantages of the cooperative, its compatibility and the generation of alternative and consistent income for the members.

***a) Relative advantage* –** The relative advantage of the cooperative is the degree to which it is perceived to be better than the existing system/channel for distributing mud crab (Roger, 1995). Crab selling through the cooperative may help the members to assess the crab quality and quantity, to grade the crab, to set/negotiate the required price for the product and, thus, to ensure income security for all channel members, with this not possible with the existing value chain practices.

***b) Compatibility* –** The cooperative may be perceived as consistent with the existing values, and past experiences and needs of potential adopters which can positively convey its perceived benefits (Rogers, 1995). Tornatzky and Klein (1982) proved that innovation will have a high probability of being adopted if it is highly compatible with one's job responsibilities and value system.

***c) Generation of alternative and consistent income* –** Adoption of the cooperative in the mud crab value chain will enable the channel members to earn consistent income throughout the year. The crab business through the cooperative may provide ready cash flow for the fishers, their family members and other channel members all year round through facilitating various alternative income-generating activities. Introducing the mud crab cooperative in the distribution channel will enable various experiments to be conducted, such as engaging the middlemen, crab fishers or family members of the crab fishers in different types of packaging for processed crab meat, as well as engaging them to make different types of bamboo baskets, net pots, etc. during the lean season for the purpose of safe transportation.

Perceived barriers to a cooperative: The barriers to a cooperative refer to the complexity that arises from its use (Rogers, 1995), with this negatively related to

its adoption. The barriers to a cooperative include the perceived risk, perceived sacrifice and perceived resistance in adopting the cooperative from the viewpoints of the existing dominant channel members.

***a) Perceived risk* –** The perceived risk of a cooperative refers to consumers' perceptions of the uncertainty and possibly undesirable consequences of adopting a cooperative in the mud crab value chain (Littler & Melanthiou, 2006). It also includes the performance risk of a cooperative which refers to the possibility of the cooperative malfunctioning and not performing as it was planned and, therefore, failing to deliver the desired benefits (Grewal et al., 1994).

***b) Perceived sacrifice* –** The existing channel members (especially those who are currently dominant in the channel) will be required to sacrifice their prevailing role once the cooperative is introduced in the mud crab distribution chain. In the proposed value chain, the cooperative will be the pivotal entity and all other channel members will be members of the cooperative. However, if the existing channel members are not convinced of any tangible gain in adopting the cooperative, they may be demotivated to sacrifice the existing system of business and, thus, demotivated in relation to joining the cooperative (Chen & He, 2003; Tsai et al., 2010).

***c) Perceived resistance* –** As the existing dominant channel members must sacrifice their dominant role in the chain, they are likely to resist the smooth adoption of the cooperative in the mud crab distribution chain. This resistance is likely to negatively influence the attitude towards and participation in the mud crab cooperative.

Social influence: The existing literature and theory recognize the impact of social norms or influences on individual behaviour (Ajzen & Fishbein, 1980; Quaddus & Hofmeyer, 2007). Existing channel members' perceptions of social pressures influence them on whether to engage in the cooperative and thus have a strong effect on adoption behaviour. Social influence in the mud crab context includes peer pressure and family influence. Past studies have shown evidence that the influence of familial and peer-based reference groups is positively related to individual decisions (Childers & Rao, 1992; Rosen & Olshavsky, 1987). The

adoption of an innovation by an individual's peers, for example, their superiors, colleagues, and customers, may signal its importance and advantages and thus influence that individual to adopt the same innovation.

Situational factors: Situational factors include the self-efficacy of the channel member, the channel member's experience and support from the government and non-governmental organizations (NGOs). Self-efficacy is a motivational construct which influences an individual's choice of activities, goal levels, persistence and performance in a range of contexts (Zhao et al., 2005). It represents people's judgements of their capabilities to implement a specific behaviour at a specific performance level (Bandura, 1997; Sommer & Haug, 2011). Experience can be understood as "a person's observation of and/or interaction with objects, entities and/or events in her/his environment" (Lombard & Snyder-Duch, 2001; Sommer & Haug, 2011). Past studies have shown that experience influences future behaviour (Conner & Armitage, 1998; Pavlou & Fygenson, 2006). Therefore, existing channel members' experience in using and trying a cooperative will affect their attitude and its adoption (Xu & Quaddus, 2007). On the other hand, previous research has shown that the availability of external support has positively influenced the decision to adopt a cooperative (Gatignon & Robertson, 1989; Zinatelli et al., 1996). Thus, support from the government and NGOs will increase the likelihood of adopting a cooperative (Quaddus & Hofmeyer, 2007; Roessner, 1988).

Attitude towards a cooperative: The attitude towards an object can be considered as a person's general belief and/or feeling of favourableness or un-favourableness that leads to their behaviour (Ajzen & Fishbein, 1980). The attitude towards the cooperative is likely to influence the positivity towards the intention to adopt the cooperative.

Intention to be engaged with a cooperative: The intention to be engaged with a cooperative refers to the mental state of the existing channel member towards adopting the cooperative in the mud crab value chain. This intention of the channel members is likely to influence their perceptions of a sustainable livelihood.

Perceived sustainable livelihood: The term 'perceived sustainable livelihood' refers to the existing channel members' perceptions of the quality of their livelihood after they have adopted the cooperative in the mud crab distribution channel. This

adoption will enable the crab fishers to reap benefits such as earning a fair price, and alternative and consistent income generation throughout the year. These benefits will foster their economic and social security and, thus, will ensure the sustainability of the crab fishers' livelihood (Roy & Chan, 2012).

Therefore, the researcher posits that the introduction of a cooperative guided by the principles of the social business concept will be able to improve the existing mud crab value chain enhancing the sustainable livelihood of the mud crab fishers.

2.7.1 Application of Social Business Principles in the Proposed Research Model

A summary of the links between the social business principles (Yunus et al., 2010) and the factors of the proposed behavioural model (shown in Figure 2.10), and how the model is expected to ensure a sustainable livelihood for the crab fishers is presented in Table 2.4.

Table 2.4: Link between the social business and factors of the proposed model

Factors/variables	Principles of the Social Business
1. Individual factors	The social business emphasizes making use of the individual's existing knowledge, skills and experiences to initiate a social business entity and involving the surrounding stakeholders of that individual in a flexible way (Yunus & Weber, 2010).
2. Channel factors	One of the key principles of the social business is that the parties involved in the system will act under a cooperative paradigm instead of under a conventional competitive paradigm (Yunus et al., 2010). Taking this principle of the social business into consideration, the proposed model focuses on cooperation between the channel members instead of the current competitive mindset in order for them to run the cooperative and to reap the benefits from it.
3. Perceived benefits of cooperative	The social business concept favours social profit-oriented shareholders. It includes innovative links between all stakeholders to attain a social mission (Yunus et al., 2010). Keeping this in mind, the crab fishers, like other channel members, will become members of the cooperative under the proposed value chain, and thus will break out from the middlemen's current exploitation trap. Numerous income-generating activities will also be created by the cooperative which will ensure consistent income for family members of

	the crab fishers and other channel members throughout the year.
4. Perceived barriers to adopting cooperative	The middlemen of the existing mud crab value chain are likely to resist adoption of the cooperative as it will threaten their current empire. However, the cooperative will be run by the members through collaborative partnerships, a key component of building a social business (Yunus et al., 2010). Hence, the cooperative will offer benefits to all channel members, and it will offset the middlemen's potential resistance through presenting a win–win situation.
5. Social influence	The social business encourages working with peers and, thus, social influence is recognized in initiating and running a social business (Yunus & Weber, 2010). As the proposed cooperative will be a social business entity, its adoption and operations will be likely to be influenced by people, such as peers, friends or family members.
6. Situational factors	Situational factors include the experience of the channel members regarding the support received from government and non-governmental organizations (NGOs). As previously mentioned, the social business encourages utilization of individuals' experiences: it also involves stakeholders, such as the government and NGOs, in how the business is built and run (Yunus & Weber, 2010).
7. Outcome: Perceived sustainable livelihood	Three key components of the social business model framework (Yunus et al., 2010) are: (i) value proposition for stakeholders; (ii) social profit equation focusing on ensuring social and environmental benefits; and (iii) economic profit equation emphasizing only the recovery of cost and capital and not maximizing financial profit. Guided by these three components of the social business, the proposed mud crab cooperative is expected to ensure a sustainable livelihood for the crab fishers.

Therefore, from Table 2.4, it is evident that the proposed factors influencing the adoption of the cooperative in the existing mud crab value chain are theoretically driven specially driven by social business principles.

2.7.2 Addressing the Research Gaps with the Proposed Model and the Social Business

As mentioned before, improving the livelihood conditions of poor fishers through VCA has to date received little or no attention. Moreover, the governance within the

mud crab value chain is a concern in the Bangladesh context. Despite locating some research on the aquatic value chain, no research to date has focused on what type of governance structure is suitable for the mud crab value chain. It is also evident that improvement in the value chain is particularly important for the mud crab sector of Bangladesh as the mud crab fishers suffer from poverty and an unsustainable livelihood. Based on these research gaps, this research aims to utilize the concept of the social business in order to develop a fishers' cooperative in the existing mud crab value chain and to govern the same based on social business principles, which will help the fishers to attain a sustainable livelihood. With this in mind, the researcher, guided by the social business concept, attempts to explore the factors that may influence the mud crab value chain members to adopt the cooperative for their everyday trading, business and livelihood. Therefore, the stated research gaps identified earlier in this chapter and in the introduction chapter can be addressed by testing the proposed model which is guided by the social business concept.

2.8 CONCLUSION

As is evident from earlier discussions, this chapter has presented the literature review which addresses various issues relating to this research, such as: the mud crab value chain; value chain analysis (VCA); improving the value chain through vertical integration and the introduction of a cooperative; the theoretical background in terms of the social business; the applicability of the social business concept in a cooperative context; the governing philosophy of a cooperative, etc. The conceptual grounding of the study has been postulated through reviews of relevant theories, such as Porter's value chain model, the social business concept and the theory of planned behaviour (TPB). Based on the structure developed by analysing the existing theoretical frameworks, this chapter also reviewed relevant contemporary empirical studies. Finally, a preliminary research model has been presented which, to attain the research objectives, is later fine-tuned and contextualised by a field study. In the next chapter, the researcher attempts to outline the research methodology adopted in this research.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter outlines the research processes and methods used to explore the research questions and to address the objectives discussed in Chapter 1. This study, using a pragmatist research paradigm (Patton, 1988; Morgan, 2014), follows a mixed-methods research design to cover a two-stage research process, that is: i) a qualitative field study to enhance the theoretical model and develop a survey instrument, and ii) a quantitative study to test the research hypotheses. In this chapter, the paradigm of the mixed methodology approach is first described, and then the method of conducting the qualitative and quantitative stages of the research is outlined.

3.1 RESEARCH PARADIGM

The research paradigm provides a conceptual framework which reflects how a research study is designed, how data are collected and interpreted, and how the findings are presented (Myers, 1997). It reflects the world view of the problem (Guba & Lincoln, 1994) and can be defined as a basic set of beliefs or philosophical ideas that guide or influence the researcher's works, actions and arguments (Guba, 1990). Although philosophical ideas remain largely hidden in research, they still influence the research and need to be identified (Creswell, 2013), with this reflecting the necessity of choosing a specific paradigm. The three major research paradigms, positivism, constructivism and pragmatism, are outlined below:

Firstly, the positivist paradigm is the empirical paradigm of research that employs deductive logic to test, observe and measure the real-world objectives through precise and rigorous quantitative methods, such as surveys and statistics (Creswell, 2013; Neuman, 2002). Secondly, the constructivist paradigm, often known as the interpretivist paradigm (Neuman, 2002), is typically an approach to qualitative research through the means of in-depth interviews, focus groups and participant observation. From these means, researchers develop subjective meanings of the participants' experiences, use inductive logic and interpret the findings based on the broad complexity of the context (Creswell, 2013; Guba & Lincoln, 1994).

Thirdly, the pragmatist paradigm focuses on both qualitative and quantitative research methods, based on the fact that research questions or problems are more important than either the method used or the paradigm that underlies the method. To collect, analyse and interpret the data, pragmatist researchers are free to choose all the available methods and techniques to meet the research objectives (Morgan, 2007; Patton, 1990; Teddlie & Tashakkori, 2003). Thus, this approach is applicable to mixed-methods research where inquiries can be drawn liberally from both quantitative and qualitative assumptions (Creswell, 2013).

The paradigm broadly influences the establishment of the methodological basis of the study (Neuman, 2002). Paradigms cover three key issues, that is, the ontological, epistemological and methodological aspects of the research. The ontological aspect of the research focuses on the nature of the reality of the research problem (Guba & Lincoln, 1994); the epistemological aspect deals with the relationship between the researcher and the researched subjects (Burrell & Morgan, 2017). The methodological aspect focuses on the process of conducting the research. Table 3.1 presents a summarized view of the paradigms based on these key issues.

Table 3.1: Comparisons between research paradigms
(Source: Nelson, 2006)

Key Aspects	**Research Paradigms**		
	Positivism	**Constructivism**	**Pragmatism**
Ontological (What is the nature of reality?)	Naïve realism; Reality is objective and singular, set apart from the researcher.	Relativism; Multiple, local and specific 'constructed' realities.	Accept external reality; Choose explanations that best produce desired outcomes.
Epistemological (What is the relationship of the researcher to the researched?)	Objective point of view; researcher and the one being researched are independent.	Subjective point of view; researcher and the one being researched are inseparable.	Both objective and subjective points of view.
Methodological (What is the process of the research?)	Deductive process; quantitative: experiments, surveys, hypothesis testing.	Inductive process; qualitative: in-depth interviews, focus groups, participant observation.	Both inductive and deductive; both quantitative and qualitative approaches (mixed-methods approach).

To adopt a paradigm and approach for this study, it was important to focus on the study's research questions and objectives. This research aims to explore the factors that impact on the existing mud crab value chain and the sustainable livelihood of crab fishers in coastal Bangladesh and, thus, attempts to discover how the social business model can be used to develop an improved mud crab value chain to enrich the livelihood of crab fishers. In other words, this research involves developing an improved mud crab value chain. For this purpose, it is important to better understand the current situation of the mud crab value chain from both ontological and epistemological viewpoints and then to suggest an improved value chain accordingly. Furthermore, this research aims to assess whether the recommended improved mud crab value chain will be acceptable to the existing value chain members, and specifically to the crab fishers, and, thus, whether it will enhance their sustainable livelihood. This aim of the research involves a deductive, objective-oriented method to test the acceptability of the proposed value chain. Therefore, the research method is much like the sequential exploratory strategy, one of the mixed-methods strategies suggested by Creswell (2013), involving a qualitative approach leading to a quantitative approach to fulfil the research objectives. Overall, these mixed methods, combining the sequential qualitative inquiry followed by the quantitative approach, belong to a pragmatic research paradigm, as shown in Table 3.1.

Considering the lack of relevant empirical studies on how the existing mud crab value chain is impacting on the livelihood of the crab fishers and on how to improve the sustainability of the livelihood of the crab fishers, adoption of a mixed-methods approach (both qualitative and quantitative) under the pragmatist paradigm is considered to be the most appropriate philosophical world view for this research. Epistemologically, the pragmatist approach can combine both subjective and objective points of view and can use both inductive and deductive logic for a better understanding of reality and for explaining the findings; as is the case in the current research. Pragmatist researchers Tashakkori and Teddlie (1998, p. 30) suggested to researchers: "study what interests and is of value to you, study it in the different ways that you deem appropriate, and utilize the results in ways that can bring about positive consequences within your value system". Hence, in this study, the pragmatist stance is supported because specific decisions regarding the use of

qualitative and quantitative methods depend on the research questions, which require a very practical and applied research philosophy. The mixed-methods approach in this research helps in two ways: (i) the qualitative phase answers exploratory questions about how and what factors of the mud crab value chain influence the livelihood of crab fishers (for this, it is important to gather the opinions of value chain members which leads to the development of survey instruments); and then (ii) the confirmatory quantitative phase which demonstrates the effects of numerous factors on predicting a sustainable livelihood for the crab fishers.

3.2 RESEARCH DESIGN AND APPROACH

Any research requires a careful plan and a comprehensive research design with detailed procedures for investigating the event/phenomenon and obtaining the information needed to solve the research problem (Malhotra, 1999). Research design can be classified into three categories: exploratory, descriptive and causal (Zikmund & Babin, 2010). Exploratory research provides insights into and comprehension of the problem situation confronted by the researcher (Malhotra, 1999). It is usually conducted to clarify ambiguous situations, define the research problem more precisely or discover ideas that may open up potential opportunities for business and further research (Zikmund & Babin, 2010). The primary objective of descriptive research is to describe the market characteristics or functions of the event/phenomenon under investigation (Malhotra, 1999). It is a type of conclusive research as it describes the event/phenomenon in a more precise manner. On the other hand, causal research identifies cause–effect relationships between events or phenomena (Zikmund & Babin, 2010).

As discussed earlier, the key purpose of the first stage of this study is primarily exploratory in nature. Hence, a qualitative approach is regarded as the most suitable option as it provides a better understanding of the mud crab fishers' current situation followed by a confirmatory stage of research to find out how to improve the livelihood conditions of the crab fishers. Figure 3.1 shows the three distinct phases in this study of mixed-methods research divided into exploratory and confirmatory phases. It shows that the process of the first exploratory phase starts with a literature review: this leads to the development of the preliminary research model followed by a qualitative field study with a semi-structured discussion schedule which helps to

finalise the research model. Phase 2 of the research is then initiated in order to test the research model through a quantitative survey using a structured questionnaire.

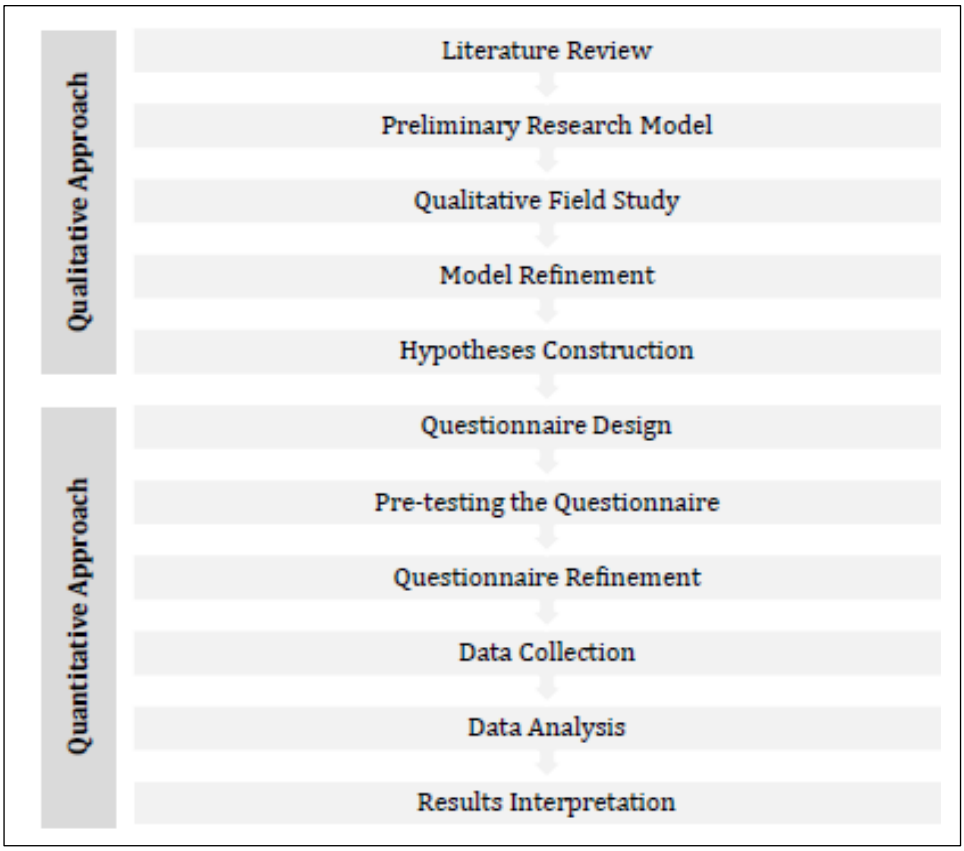


Figure 3.1: Research design based on mixed-methods approach

3.2.1 Literature Review and Preliminary Research Model

The first step under the mixed-methods approach is to conduct a thorough literature review on the research topic. Chapter 2 of this thesis outlined an exhaustive literature review which addresses various issues relating to this research, such as the mud crab value chain; value chain analysis (VCA); improving the value chain through vertical integration and introducing a cooperative; the theoretical background in terms of the social business; the applicability of the social business concept in a cooperative context; and the governing philosophy of a cooperative, etc. The conceptual grounding of the study has been postulated through reviews of relevant theories, such as Porter's value chain model, the social business concept and the theory of planned behaviour (TPB). Based on the literature review, a preliminary research model has been presented in Chapter 2 (see Figure 2.10). In the next section, the qualitative data collection is outlined.

3.2.2 Qualitative Data Collection

The primary reason for conducting a qualitative field study is to explore the current livelihood conditions of the crab fishers and to identify the factors that impact on their livelihood. The information required for a qualitative exploratory study is usually loosely defined, and the research process that is adopted is flexible, unstructured and may consist of in-depth interviews with a small sample (Malhotra, 1999). Hence, as the current study is exploratory in nature, a semi-structured, in-depth interview technique (Saunders et al., 2009; Wilson, 2006) was employed to collect data to enhance the researcher's familiarity with issues surrounding the research problem (Robson, 1993). In-depth interviews are useful when a focus on contemporary events or a natural setting is required to understand and describe a particular context (Carson et al., 2001). A semi-structured interview format is also used to overcome interviewer bias that may result from the lack of standardization in the data collection process (Colgate et al., 2007).

Guided by the extensive literature review discussed in Chapter 2, the study developed a semi-structured discussion guide for conducting in-depth interviews with the groups of crab fishers and crab suppliers. The in-depth interviews were conducted in homogeneous groups (groups of fishers and groups of suppliers) as group discussion facilitates an environment in which to talk as participants find their fellow group members are talking (Frey & Fontana, 1991). Prior to the actual field study, the semi-structured interview schedule was pre-tested among three respondents. As the crab fishers of the rural areas are mostly illiterate, emphasis was placed on whether the potential respondents could really understand the words of the questions. The researcher collected the qualitative data through in-depth interviews guided by the guidelines of McGivern (2013), Carson et al. (2001) and Whiteley (2004) who argued that the structure of qualitative research interviews should have three phases: planning, starting and managing the interviews. McGivern (2013) stressed that an interview should start with a clear introduction and 'warm up', then the main body, followed by a clear signal of ending or 'wind down'. These suggested guidelines were followed to develop the interview structure and, finally, to conduct the actual interviews. The researcher always started with an informal but research-relevant introduction asking the interviewees about their role and the business

importance of their company. The interview schedule was arranged based on interviewee convenience, availability and voluntary willingness.

A total of six group interviews were conducted among 32 respondents (in six groups) in two coastal areas of Bangladesh: the south-east coastal region (greater Chittagong division) and the south-west coastal region (Khulna division). The interviews were recorded and transcribed verbatim. The interview transcripts were read and re-read and then analysed through deductive (Boyatzis, 1998) thematic analysis (Braun & Clarke, 2006). The analysis of the qualitative data explored the current livelihood situation of the crab fishers and suggested a refined mud crab value chain with a fishers' cooperative (guided by the social business model) in place. This helped the researcher to refine the initial research model and, thus, to confirm the final model of factors that influence the adoption of the fishers' cooperative in the existing mud crab value chain through a quantitative study. The next chapter (Chapter 4) provides details of the sample respondents, and discusses the processes of data collection and analysis

3.2.3 Quantitative Data Collection

The key motivation for pursuing a quantitative study is to examine whether the current mud crab value chain members are willing to accept or be engaged with a fishers' cooperative which will be operated under social business principles. This involves analysing the relationships between different factors that influence the adoption of a cooperative in the mud crab value chain and to test whether this adoption will enhance the perceived sustainable livelihood of the crab fishers. Hence, this part of the study is causal research under a quantitative approach (Malhotra, 1999). The quantitative research approach is deemed suitable as it provides a generalization about the relationship(s) between two (or more) variables by testing it/them within a sample based on collected data using different statistical analyses (Malhotra, 1999). The quantitative study follows different steps comprising questionnaire development, pre-testing, applying the sampling technique, conducting data collection through the survey and data analysis. These steps are briefly outlined below.

3.2.3.1 Questionnaire development

Guided by the comprehensive research model (Figure 2.10 in Chapter 2), the study developed a questionnaire to examine the effects of the different factors in the adoption of a cooperative in the mud crab value chain and to test the relationships between the constructs of the model. The final research model is described in Chapter 5 and the questionnaire development and pre-testing process is discussed in Chapter 6. As this study deals with crab value chain participants, the researcher surveyed both crab fishers and crab suppliers through two survey instruments in order to reflect the opinions of the major participants of the value chain. Most measurement items of the constructs and sub-constructs in the study were adopted from previous scales in past studies, but reflecting the findings of the qualitative field study for contextualisation. All the questions, except those related to the demographic data, used a six-point Likert-style scale ranging from '1' (strongly disagree) to '6' (strongly agree). The use of the Likert scale is in line with existing research of the past 15 years where the application of structural equation modelling (SEM) has mostly relied on the Likert scale (Byrne, 2013). When developing the questionnaire, the existing research has primarily used a seven-point Likert scale with a mid-point as respondents are often likely to feel neutral about the issue being examined (Hair, 2007). However, the current research chose to use a six-point scale. This was in line with Matell and Jacoby (1971) who advised not to use the neutral point when the scale consisted of many points, thus avoiding the central tendency error likely to be committed by respondents. The central tendency error usually occurs when respondents tend to select a mid-point when answering a survey questionnaire without even meaning this to be their answer. The details of the questionnaire development, including the list of scale items and their sources, are discussed in Chapter 5.

3.2.3.2 Pre-testing of the questionnaire

Before conducting the actual survey, the questionnaire was pre-tested by 12 crab fishers and four crab suppliers to ensure that the wording was appropriate and to identify any problems with this survey instrument. Pre-testing also helped the researcher to determine whether respondents would find it difficult to understand any of the items. The survey instrument, after approval by the Curtin University Human Research Ethics Committee, was translated into the local Bangla language to help the

respondents to more easily answer the questions. However, an understanding of the questions in Bangla was also necessary as most crab fishers are less educated; hence, they may not understand the academic jargon in the survey instrument. Therefore, it was imperative to pre-test the survey questionnaire and to appropriately refine it so the instrument would be easily understandable to respondents. Finally, the questionnaire, based on the opinions of the pre-test respondents, was revised by making minor adjustments to the wording and by enhancing the clarity of the question items.

3.2.3.3 Population and sample

The process of sampling design depends on the target population that represents the sample of elements or objects that have relevant information and about which inferences are drawn (Malhotra, 2008). In addition, the target population draws the boundary line between respondents and non-respondents and, thus, emphasis is laid on being as specific as possible to decide who should and who should not be in the sample. The population of this research is defined as the participants of the mud crab value chain, that is, the crab fishers and crab suppliers in coastal Bangladesh. Most of the crab fishers and suppliers are located in the south-western (Khulna division) and south-eastern (Chittagong division) parts of Bangladesh. The nature of the crab fishers is similar in these two broad areas; hence, the sample of crab value chain members was selected from the south-eastern coastal areas of Bangladesh that comprise mainly the Chittagong and Cox's Bazar district. A total of 185 crab fishers and 89 crab suppliers participated in the survey using the two survey instruments, with participants in the sample selected from the Chittagong and Cox's Bazar district using quota sampling to represent both the crab fisher and crab supplier population.

3.2.3.4 Data collection

The operationalization of the survey for data collection is usually decided based on the nature of survey interaction and the mode of questionnaire administration (Malhotra, 2008). In this study, in order to interact and conduct the survey with the crab fishers and suppliers, the location intercept technique was used due to its utility in ensuring a good response rate in comparison to other methods (Andaleeb, 2001; Malhotra, 2008). In applying the location intercept technique, the crab fishers and crab suppliers were approached as they gathered in local huts and/or the bazaar either

to sell their catches or in their leisure time. Thus, a physical face-to-face survey was executed to collect the data from local crab fishers and suppliers.

3.2.3.5 Data entry, examination and analysis

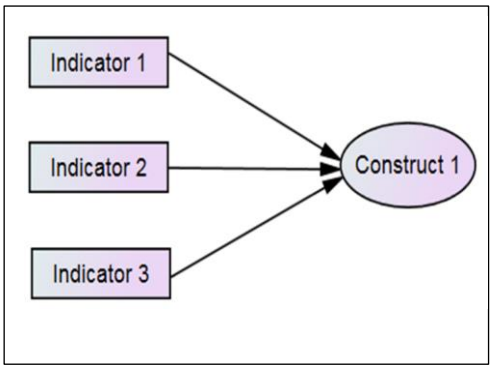
Data gathered from the survey were immediately entered into IBM SPSS Statistics (SPSS) software. The data entered into SPSS were screened for missing values, outliers and relevant other requirements, such as normality and bias tests, the details of which are discussed in Chapter 6. Once the data were cleaned and ready for analysis, partial least squares (PLS)-based structural equation modelling (SEM) was then used for analysis.

Structural equation modelling (SEM) is a multivariate technique combining aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts—factors—with multiple variables) to simultaneously estimate a series of interrelated dependence relationships (Hair et al., 1998). The SEM technique has greater flexibility and was chosen for the current study after considering the following substantial advantages over first-generation techniques (Chin, 1998a; Hair et al., 1998; Holmes-Smith, 2001). Structural equation modelling (SEM) can be applied to a model of multiple relationships among multiple predictors and criterion variables in the form of multiple regression and path analysis. The relationships for each dependent variable are translated and tested in a series of structural equations similar to regression equations. In addition, SEM involves unobservable latent variables by estimating the relationships among 'latent' constructs and underlying observed variables. Furthermore, SEM examines validity, reliability and the relationships between the latent variables to confirm a theory or model. This ability of SEM has provided a transition from exploratory to confirmatory analysis. The two ways of estimating the parameters in SEM are: i) covariance-based SEM (COV-SEM) using LISREL, EQS or AMOS software and ii) component-based SEM (PLS-SEM) using PLS-Graph, Visual PLS and Smart PLS. The SEM-based analysis involves two traditions: an econometric perspective focusing on prediction, and a psychometric emphasis that models concepts such as latent (unobserved) variables that are indirectly inferred from multiple observed measures (Chin, 1998b).

The choice of a SEM technique from these two approaches depends on the specific situation, the modelling of the construct with its measurement items and the objective of the study, such as whether it will be used for theory testing and development or for predictive applications. The COV-SEM technique is best suited for theory testing and development, that is, how well a theoretical model fits observed data, whereas variance-based SEM is primarily intended for causal-predictive analysis with a complex model used to test its predictive power (Barclay et al., 1995). The covariance-based approach attempts to minimize the difference between sample covariance and those predicted by the theoretical model. Therefore, the parameter estimation process attempts to reproduce the covariance matrix of the observed measures (Chin & Newsted, 1999).

The PLS-SEM technique has different objectives, such as allowing formative measures and testing hypotheses by predicting antecedent conditions on the dependent variables. The use of formative measures in COV-SEM becomes problematic as it attempts to account for all the covariance between the measures due to the statistical algorithm that assumes the correlations between indicators for a particular latent variable are caused by that latent variable; therefore all items in COV-SEM must be modelled as reflective (Chin, 1998b; Fornell & Bookstein, 1982). Attempts to create a model with formative indicators may lead to an 'identification problem' (Jarvis et al., 2003) and can produce invalid estimations despite the presence of a reasonable goodness of fit (Chin, 1998a).

The formative items of a construct cause the latent variable (see Figure 3.2(a)); therefore, the items are assumed to be not correlated and measure different underlying dimensions of the latent variable (Chin, 1998b). Hence the elimination of items is a serious concern as the elimination of one item may change the meaning of the construct (Jarvis et al., 2003). On the other hand, reflective items are deemed to be caused by the latent variable (see Figure 3.2(b)). Due to the causal nature of the relationship between each item and the latent variable, any change in the construct would result in changes in the items. In addition, measures under a construct share a common theme that matches the essence of the construct (Jarvis, et al., 2003).



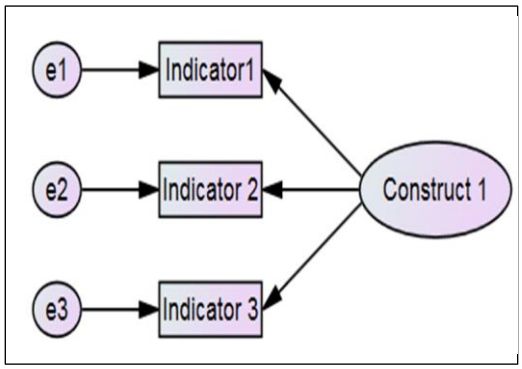


Figure 3.2(a): Formative construct **Figure 3.2(b) Reflective construct**

Table 3.2 outlines the summary of the decision rules for formative versus reflective constructs.

Table 3.2 Decision rules for formative and reflective constructs

(Source: Jarvis, Mackenzie & Podsakoff, 2003)

Particulars	Formative model	Reflective model
Direction of causality between construct and measures	Direction of causality is from items to construct.	Direction of causality is from construct to items
Are the measurement items defining characteristics of the construct?	Measurement items are defining characteristics of the construct.	Measurement items are manifestations of the construct.
Do changes in measurement items cause changes in the construct?	Changes in the measurement items should cause changes in the construct.	Changes in the measurement items should not cause changes in the construct.
Do changes in the construct cause changes in the measurement items?	Changes in the construct do not cause changes in the measurement items.	Changes in the construct do cause changes in the measurement items.
Interchangeability of the measurement items	The measurement items need not be interchangeable.	The measurement items should be interchangeable.
Do the measurement items have the same or similar content?	The measurement items need not have the same or similar content.	The measurement items should have the same or similar content.
Is there any covariation among the items?	Not necessary for items to co-vary with each other.	Items are expected to co-vary with each other.
Is a change in one of the indicators associated with	Not necessarily	Yes

changes in the other indicators?		
Are the measurement items expected to have the same antecedents and consequences?	Items are not required to have the same antecedents and consequences.	Items are required to have the same antecedents and consequences.

3.2.3.6 PLS estimation – second-order hierarchical model

As mentioned before, the researcher employed PLS-based SEM to analyse the data using Smart PLS 3 software. The three approaches used to estimate hierarchical latent variables in PLS-based SEM are: (a) the repeated indicator approach; (b) the two-stage approach; and (c) the hybrid approach (Becker et al., 2012).

The current study used the repeated indicator approach in order to create second-order constructs that represent all the manifest variables of the underlying first-order latent variables. Manifest variables were used twice in the study, that is, to estimate first-order and second-order latent variables. As per the literature on PLS-SEM (Chin, 1998b; Wetzels et al., 2009), the researcher used the factor score of lower-order variables for higher-order factors. Thus, the researcher used PLS-SEM to estimate the parameters of the outer model, that is, the measurement model through the repeated use of manifest variables. On the other hand, under the two-stage approach, latent variable scores are calculated (Tenenhaus et al., 2005) as follows: the first-order scores are calculated in the first-stage model (in the absence of the second-order construct) and then the first-order construct scores are applied as indicators for the second-order latent variable (Wetzels et al., 2009; Wilson & Henseler, 2007).

3.2.3.7 PLS measurement model, reliability, validity and structural model

As in any other SEM-based data analysis, the researcher adopted a two-stage procedure for data analysis (Gerbing & Anderson, 1988) by running a measurement model to assess the convergent and discriminant validity prior to estimating the path relationships from a structural model. Under the measurement model, the researcher examined the reliability and validity of the constructs both for the crab fishers' and the crab suppliers' data sets. For this, the researcher examined the relationships between indicators and their corresponding constructs by assessing construct validity

which consisted of convergent validity and discriminant validity. Reflective item-based constructs were tested for convergent validity by determining the item reliability, internal consistency and average variance extract (AVE). Individual item reliability and internal consistency were the measures for convergent validity which evaluated how closely the items in a single construct correlated with each other (Barclay et al., 1995; Santosa et al., 2005). The discriminant validity of the study constructs was also assessed at this phase. Discriminant validity refers to the degree to which the study constructs differ from each other (Barclay et al., 1995). The basic formula for calculating reliability (composite reliability [CR]) and AVE is as follows:

Composite reliability (CR) formula

$$CR = (\Sigma \lambda i)^2 / [(\Sigma \lambda i)^2 + \Sigma \varepsilon$$

where λ is the loading for each item, and
ε is the error variance associated with each item.

AVE calculation formula

$$AVE = (\Sigma \lambda_{yi})^2 / [\Sigma \lambda_{yi}^2 + \Sigma \lambda \, Var (\varepsilon_i)]$$

where, λ = component loading to an indicator,
y = construct, i = item,
$VAR (\varepsilon_i) = 1 - \lambda_{yi}^2$

Adequate convergent validity and discriminant validity built confidence and accuracy in the structural model estimation. On the other hand, the formative constructs were examined primarily based on the factor weights and their significance level. Table 3.3 shows the systematic procedures for SEM analysis reflecting the decision parameters for assessing the constructs both at Stage 1 (measurement model) and Stage 2 (structural model).

Table 3.3: Decision parameters of SEM analysis

Stages of SEM	Construct or Items	Measurement Criteria	Decision Parameters
Stage 1: Assessment of measurement model	Formative	a) Indicator weight b) Multicollinearity	a) Review construct conceptualization and *t*-value = 1.65 (*p=0.1*) b) VIF ≤ 10 or ≤ 5
	Reflective	a) Convergent validity b) Item reliability c) Internal consistency d) Average variance	a) Factor loading more than 0.5; AVE ≥ 0.5 b) ≥ 0.7; *t*-value >1.65

		extracted (AVE)	c) ≥ 0.7 d) ≥ 0.5
Stage 2: Assessment of structural model	Formative and Reflective	a) Coefficient of determination b) Test of hypotheses	a) $R^2 \geq 0.10$ b) Significant *t*-value = 1.96

When the measurement model had been assessed as satisfactory, the researcher moved to examining the structural model to infer the relationships between the constructs of the model. The structural model comprised hypothesized relationships between the latent constructs in the research model (Santosa et al., 2005). The researcher used different tools to assess the structural model, such as evaluating the explanatory power of the independent variables (R^2) and examining the direction and intensity of the path coefficients (β) through *t*-statistics and the corresponding significance level. The details of the data analysis, for both the measurement model and the structural model, are described in Chapter 6.

3.3 CONCLUSION

This chapter outlined the detailed research design of the study. The chapter started with a brief discussion on research paradigms and the issues related to the quantitative and qualitative methods. The rationale for choosing the mixed-methods approach (a combination of qualitative and quantitative methods) was then discussed. The chapter next described the data collection and analysis processes in both the qualitative (field study) and quantitative phases. Furthermore, the chapter focused on the reliability and validity tests of the measures, with the methods of data analysis and hypotheses testing also discussed in detail. Chapters 4, 5 and 6 provide details about the qualitative and quantitative phases.

CHAPTER 4

FIELD STUDY AND QUALITATIVE DATA ANALYSIS

4.0 INTRODUCTION

As mentioned in the previous chapter, the mixed-methods approach (Qualitative => Quantitative) has been chosen for this study. In the qualitative phase, a field study was conducted, which is presented in this chapter. The key purpose of this qualitative phase was to confirm the various constructs and sub-constructs that were identified in the literature review as well as discovering significant new sub-constructs and variables. Thus, this phase is considered as the groundwork for the quantitative study. This phase also helped to contextualise the conceptual framework developed from the literature review through the field study and helped to refine and fine-tune the initial model proposed earlier, as shown in Figure 2.7 in Chapter 2. The outcomes of this qualitative field study have helped to develop a revised research model to be used in the quantitative part of this study and to develop the survey questionnaires, as described in Chapters 5 and 6 of this thesis.

4.1 OPERATIONALIZATION OF THE FIELD STUDY

4.1.1 Method of the Qualitative Study

The qualitative field study was conducted through in-depth group interviews using a semi-structured interview schedule. Due to the exploratory nature of the study, the research process could involve a flexible and unstructured method and consist of in-depth interviews with a small sample (Malhotra, 2007). Hence, the researcher conducted the field study through the group interview method using a semi-structured discussion schedule. The group interviews were conducted among the mud crab fishers and crab suppliers of the south-eastern part of Bangladesh. Group interviews facilitate simultaneous discussion among several participants in a social context and thus enhance smooth social investigation (Frey & Fontana, 1991). They involve group interaction, and extract realities and interpretations of events that reflect group input (Lincoln & Denzin, 1994). Thus, the group interview is a cost-effective way of producing additional data by taking advantage of group dynamics. The following discussion focuses on the details of the qualitative study.

4.1.2 Developing Interview Schedule and Pre-Testing

Based on the extensive literature review and the objectives of the study, a semi-structured discussion guide/schedule was developed to conduct the in-depth group interviews (see Appendix 4.1). Prior to the actual field study, the semi-structured interview schedule was pre-tested by three respondents selected through a network acquaintance (Colgate et al., 2007). During the pre-test, care was taken to ensure that the respondents would understand each question of the discussion schedule and that it did not include any academic jargon. The discussion schedule was prepared in English: it was then translated into Bangla (the mother language of Bangladesh) by the researcher and verified by an expert who certified the appropriateness of the translated schedule (before and after) for the specific target group who were to participate in the group interviews (Andaleeb, 2001).

4.1.3 Sample Profile and Sampling Technique

The initial respondents for the group interviews were selected purposively. Given the exploratory nature of the research, purposive sampling is desirable as opposed to random sampling (Miles & Huberman, 1994). Other members of the group are then collected through snowball sampling which involves collecting a sample through referrals from among respondents who know others who possess the knowledge and characteristics that are of research interest (Biernacki & Waldorf, 1981). This led the researcher to adopt the snowball sampling method for the qualitative data collection using group interviews. However, with snowball sampling, identifying the initial contacts is always a challenge (Biernacki & Waldorf, 1981). To enable the identification of initial reference points, the researcher depended on the network acquaintances and convenience. The groups consisted of 3–7 members. The average duration of the interviews ranged from 50–90 minutes. Table 4.1 shows the demographics of the field study participants.

Table 4.1: Demographics of field study participants

Interview ID	Area	Interviewee category	Total no. of interviewees	Average Age
GI1	Mirerhat, Sitakundo	Crab fishers/ catchers	3	51
GI2	Moheshkhali	Crab fishers/ catchers	3	42
GI3	Chakaria	Crab suppliers	7	41

GI4	Khulna	Crab fishers/ catchers	6	43
GI5	Khulna	Crab collectors/ suppliers	5	38
GI6	Khulna	Crab *aratders*	4	49

4.2 DATA COLLECTION

In total, six group interviews were conducted in two coastal areas of Bangladesh in the south-east coastal region (greater Chittagong division) and the south-west coastal region (Khulna division) of the country. In the Chittagong division, two group interviews were conducted among the crab fishers (GI1 and GI2: three respondents each) and one group interview was conducted among the crab *aratders* or suppliers (GI3: seven respondents). In the Khulna division, one group interview was conducted for each of the crab fishers (GI4: six respondents), crab collectors (GI5: five respondents) and crab *aratders* (GI6: four respondents). The groups consisted of 3–7 members. The average duration of the interviews ranged from 50–90 minutes.

Each group interview was conducted face-to-face, which has been shown to be helpful in acquiring factual information and also helps when probing for further in-depth explanations and details in specific areas. Before starting the group interview, the key purpose and a brief description of the study were provided. The respondents were informed that their participation would be fully voluntary and that the information would be dealt with confidentially. The interview began with some basic introductory questions to warm up the participants before going into specific details. After the introduction, the respondents were asked the leading questions. For a better understanding of the relevant issues, their answers were probed further. The interviews were recorded with a voice recorder after receiving permission from the respondents, with this enhancing the accuracy of the transcription (Patton, 1990). The transcript of each interview was reviewed and carefully read to identify themes and patterns from the data. The interviews were conducted mainly in Bangla; and the recordings of the interviews were transcribed in Bangla as soon as possible so that all relevant information from the interview was correctly recorded. All transcripts were then translated into English with efforts made to retain the original meaning of respondents' answers. The average session for each interview was approximately 70–80 minutes.

4.3 DATA ANALYSIS

At the data analysis stage, the transcribed data were analysed using content analysis to determine the key factors, constructs and links between the constructs. Content analysis is a useful technique for exploratory research to determine behavioural patterns (Miles & Huberman, 1994). From the six group interviews in the field study, about 100 pages of transcripts were produced. A sample qualitative group interview transcript is presented in Appendix 4.2. Data were then processed from the transcripts through thematic analysis (Braun & Clarke, 2006). The discovered themes were coded with specific names/labels through the deductive procedure (Boyatzis, 1998). Thus, the deductive coding procedure used to determine the themes was driven by the researcher's theoretical or analytical interest area, that is, whether the theme captured something that was important to the overall research question (Braun & Clarke, 2006). Figure 4.1 below shows the data analysis process used for the field study.

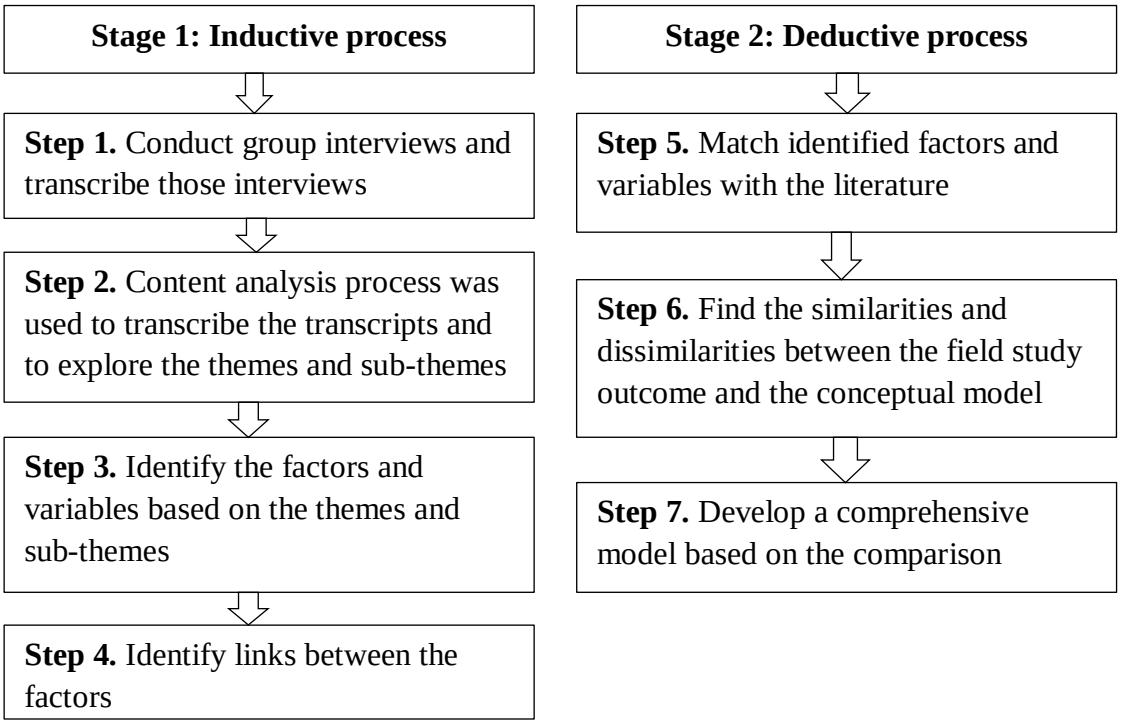


Figure 4.1 Data analysis process of the field study

4.3.1 Codes and Themes from Group Interviews

The transcripts of the group interviews were read and re-read to find the relevant codes and themes. The analysis process proceeded based on the sequence of the

questions in the interview schedule. The derivation of the key codes and themes was influenced by the key research objectives, that is, whether a cooperative would be adopted by the crab fishers and, if so, what factors would influence the crab fishers to adopt a cooperative within the current crab business exchange process. When the analysis found a key theme, the study attempted to label it based on the existing literature. If multiple relevant themes were found, those themes were then coded under a specific factor by the researcher.

At the first step of Stage 1, the researcher conducted and then transcribed the interviews and analysed the transcripts. All the transcriptions were done manually as the interviews and transcriptions were in Bangla, the mother language of the researcher, and only a few interviews had been conducted. At the second step, the details in the transcripts were examined to discover the key themes and sub-themes, with these forming the basis for the key words used to find key factors and variables. Finally, all the themes and sub-themes were linked with the identified factors and variables. It was also important to check that all the factors and constructs were consistently obtained from the qualitative study.

Stage 2 of the content analysis was conducted to match the identified factors and variables to the literature. The main purpose was to identify similarities and dissimilarities among the variables. Based on the similarities between the variables, they were integrated by a specific suitable name, although those variables that were unique were retained. Obtaining a clear picture of the findings was necessary in order to eliminate inconsistent constructs. Finally, the new combined comprehensive model was developed, as shown in Figure 4.7.

4.3.2 Validity of the Qualitative Information

The researcher adopted different measures to ensure the validity of the information collected from the group interviews. Firstly, expert opinion was sought regarding the wording and flow of the questions. The researcher consulted with her supervisor and another academic (who has relevant field experience) about the wording and the questions in the interview schedule. Secondly, a pre-test was conducted in order to examine whether the wording and the flow of questions made sense to the respondents. The discussion schedule was updated based on the recommendations

received from the two experts as well as from the pre-test. Thirdly, a conscious effort was made to avoid using academic jargon (e.g. social business, sustainability, etc.) during the interviews to minimize possible contamination of the extracted data (Colgate et al., 2007). Fourthly, the interviewer used specific prompts and probing techniques to encourage elaboration and rich description. These measures for ensuring the validity of the qualitative data are consistent with the measures adopted by Colgate et al. (2007).

4.4 FINDINGS OF THE FIELD STUDY

This section describes the field study findings. The findings concentrated on checking the relevance of the factors and sub-factors in the conceptual framework within the real-life research context, that is, in the context of the mud crab value chain of Bangladesh. In doing so, the researcher attempted to match the themes derived from the interviews with the existing literature and the social business concept. The following discussion focuses on the relevance of each of the factors and sub-factors with the research context, and is supported by quotes from the respondents as well as the extant literature.

4.4.1 Mud Crab Participants and Existing Value Chain

The key participants of the existing mud crab value chain are crab fishers, crab collectors, crab suppliers, depot owners, the owner of the fattening centre, exporters' agents and exporters.

Crab fishers: Crab fishers are landless and the most marginalized people in the value chain. They supply 90% of the raw crabs that flow through the value chain. They take out a loan from the money lenders for a trip and catch crabs from the nets and boats of other parties. Crab fishers also catch crabs from the mud using iron rods (locally called '*shik*', Figure 4.2a). They carry their catch in baskets made from bamboo (Figure 4.3), and walk to the local village market to sell to either the crab collectors or to the crab suppliers. They also sell a tiny part of their catch, especially the small specimens, to the fattening centre. Sometimes, before selling to suppliers, they grade the crabs into different categories based on size and tie their claws using rope.

Figure 4.2(a) Crab catch from mud using iron rod

Figure 4.2(b) Crab tied with rope

Figure 4.3 Crab-carrying baskets made of bamboo

The crab fishers have no option but to sell their catch to the crab suppliers as: (i) they have taken out informal loans from the suppliers; (ii) they do not have contact with any other channel members; and (iii) they do not have a storage facility and/or access to a transportation facility which could enable them to later sell their catch to others. Usually, they sell their entire catch at a fixed price (lower than the market price) as per a contract with the suppliers who lent them the money. As these respondents mentioned, "*we sell the quality crab in big size[s] with hard shell[s] to the parties such as aratders or collectors"* (GI1). *"Sometimes we give all the crabs as per their predetermined price in exchange for Dadon [loans/advance money] to the suppliers"* (GI2).

Crab collectors: Crab collectors are primarily found in the south-western part (Khulna division) of Bangladesh. They are the local traders (often locally

known as *forias*) who buy crab from the crab fishers and sell to the suppliers. They have links and/or business relationships with the suppliers. As they stated, "*we mainly buy crabs from the crab fishers and then sell these to the aratders and thus earn our profit"* (GI5).

Crab suppliers: Crab suppliers are the dominant group in the value chain. They often own depots or storage facilities and a fattening centre. Hence, they can play three key roles; storing the raw crab; transporting it to the exporter; and farming the rejected and underweight crabs in the fattening centre for future sales. They finance the crab fishers as well as the collectors. They sell crabs in baskets (Figure 4.4) to the exporters' agents. Suppliers themselves often transport crab to the exporters' premises in the capital city. As they stated, *"we collect crabs from the fishers or from the collectors and do further grading and packing of those crabs as per size and weight and sell to the exporter's agent or exporters; and we also transport on behalf of them"* (GI3).

Figure 4.4: Loaded basket of crab ready to ship to exporter's agent

Exporters and exporters' agents: Exporters are the most powerful participant in the crab value chain. Exporters purchase the crabs from the local agents. The exporters may have agents who transport crab to the exporters' final destination in the capital city for export purpose. The agent has a contract with transportation companies or with truck or van owners, etc. for transportation

purposes. Exporters further process the crab to meet the requirements of foreign buyers and then export the crab.

Based on the above description, the existing mud crab value chain and the sequence of transaction relationships between the value chain members can be shown in Figure 4.5.

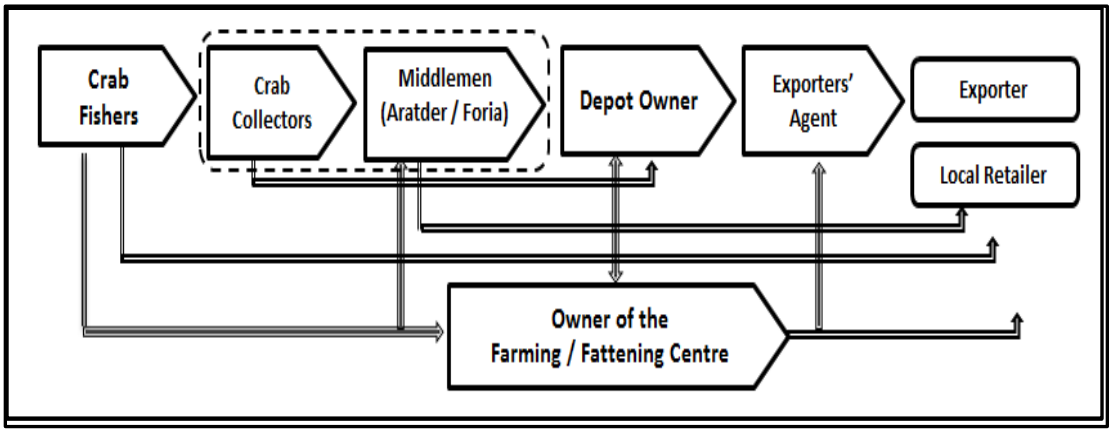


Figure 4.5: Existing mud crab value chain

As is evident from Figure 4.5, the existing mud crab value chain is long, cumbersome and involves too many parties, most of whom are rather independent. The value chain is largely dominated by the crab middlemen or suppliers with the crab fishers the most marginalized group of participants. The livelihood conditions of the crab fishers are next explored below.

4.4.2 Livelihood Conditions of Crab Fishers

The livelihood conditions of the coastal crab fishers were analysed through the UK Department for International Development (DFID) (1999) model for sustainable livelihood. The centre-point of the DFID sustainable livelihood framework is the examination of whether the target people have access to five asset bases, namely, natural capital, physical capital, social capital, human capital and financial capital. The following discussion pinpoints the extent of the crab fishers' access to these five asset bases. The crab fishers do not have any land of their own to use for crab farming. As mentioned by respondents in GI1 and GI2, *"we do not have any land of our own. We catch crabs from khas*[5] *land, khal and bil*[6] *"*. With access to natural

[5] *Khas* land refers to government-owned unused land.

capital, such as land, able to be transformed into income-generating activities, crab fishers' lack of access to their own land contributes to their vulnerability. Moreover, none of the crab fishers have their own tube well and they "*collect drinking water from [the] shared tube well and use pond water for cooking"* (GI1). *"The crab fishers are untrained, uneducated and too poor …"* (GI3). They *"do not have any formal education or training and learnt crab catching from our parents, peers by practice"* (GI1). Frequent episodes of illness and poor health impair the crab fishers' capability to catch crab for their livelihood. *"The crab fishers and the suppliers [are] not eligible for any bank loan because it is not treated as a recognized job*" (GI3). They *"live on hand to mouth; we can't save even a single paisa (penny)*" (GI2). Sometimes, they "*are not able to earn our daily income to bear the regular expenditure …"* (GI2). Most crab fishers live in very poor housing conditions typically made of mud and bamboo with straw or leaves as the roof. They do not even have adequate fishing gear. None of the crab fishers have their own boat or fishing net. As they stated, *"we do not have our own boat or net to catch crab. We collect crab from the big fishing net of a large boat owned other merchant fishermen …"* (GI1). The villages of the crab fishers are usually inhabited by hereditary low-caste minority groups (predominantly Hindu or Buddhist). The crab fishers are disadvantaged in terms of social capital as they are usually neglected by and isolated from mainstream society, which adversely affects their livelihood and their profession of crab fishing. As they mentioned, *"… due to our profession and caste, we are kind of neglected in the society and are deprived from social benefits"* (GI2). Next, we attempt to explore the key factors contributing to crab fishers' unsustainable livelihood with this exploration guided by the DFID (1999) model of sustainable livelihood, as discussed in Chapter 2.

Natural capital: Natural capital refers to the natural resource stocks from which resource flows and services (e.g. nutrient cycling, erosion protection) useful for sustaining livelihoods are derived (Kabir et al., 2012). Natural capital includes land, water, wild fry and environmental factors that are critical for crab fishers to support their livelihoods (Ahmed et al., 2010). In the current study, the primary considerations were access to land and drinking water as well as current climate conditions, with these three variables being key components of natural capital for the

[6] *Khal* and *bil* refer to a narrow or tiny local canal and wetland, respectively.

crab fishers as they directly contribute to their livelihood. The crab fishers fully depend on natural sources of raw crab for their livelihood. As previously noted by respondents GI1 and GI2, the crab fishers do not have any land of their own to use for crab farming. Crab fishers' lack of access to land is a factor in their vulnerability as land access could be transformed into income-generating activities. They also lack their own tube wells. The effects of the current climate on crab fishers' livelihood are discussed later in this thesis.

Human capital: Human capital represents the education, skills, knowledge, ability to work and good health that together enable people to pursue their livelihood strategies and achieve their livelihood objectives (DFID, 1999). "Health is one of the most important conditions of human life and a critically significant constituent of human capabilities which we have reason to value" (Sen, 2002). Hence, in our study, we were primarily interested in the crab fishers' education, skills and health conditions as part of their human capital.

As mentioned previously by respondents in GI3 and GI1, the crab fishers lack training and education, with their skills learnt from their parents. Furthermore, respondents mentioned the frequent episodes of illness and poor health that impair the crab fishers' capability to catch crab for their livelihood. This is due to the lack of water-sealed sanitary latrines and inadequate access to safe water for both drinking and cooking, as is evident from the respondents, "*we use semi-pacca latrines and sometimes the drainage system is poor*" (GI1 and GI2). Although sanitation facilities are being extended to the rural areas of Bangladesh through government and NGO assistance, fishing villages are among the few communities in which most households still lack water-sealed sanitary latrines (Islam, 2011).

***Financial capital*:** Financial capital is an important element of human livelihood that helps people to move from poverty. It denotes the financial resources that people use to achieve their livelihood objectives. Financial capital represents income, savings and credit (Ahmed et al., 2010). Thus, the current study considered the crab fishers' income, savings and access to formal credit or the banking system as part of their financial capital that could enable them to pursue a better livelihood. As reported in previous quotes, respondents in GI3 mentioned that crab fishing was not recognized as a job, thus denying crab fishers and suppliers access to bank loans,

while respondents in GI2 commented on their precarious financial existence and inability to save, or even to meet their regular expenses. Therefore, the crab fishers are disadvantaged due to their lack of financial capital with none reported to have any savings. As a result, they require loans during moments of crisis (Ahmed et al., 2010). Unfortunately, due to their lack of access to the formal financial system, they have no option but to take financial support, locally called *dadon* (advance money), from the crab suppliers or local money lenders. A *dadon* is a transaction built upon a verbal contract between the crab fisher and the money lender (called *dadondar)* whereby the lender requires that the crab fisher sells the crabs to him (Islam, 2011) at a rate usually lower than the market price. The effects of this *dadon* system on crab fishers' livelihood is discussed later in the thesis.

Physical capital: Physical capital comprises capital that is created by the economic production process, the basic infrastructure and the goods and services needed to support livelihoods (Kabir et al., 2012). Transport, shelter, roads, markets, housing facilities and health facilities are considered to be the physical capital that enables people to pursue their livelihood strategies (Ahmed et al., 2010). In the current study, under physical capital, we considered the condition of the crab fishers' dwellings, the availability of equipment for their crab fishing and the overall infrastructural conditions of the study areas. The study findings show that the crab fishers are often disadvantaged due to poor physical capital. Most crab fishers live in very poor housing conditions, with houses typically made of mud and bamboo with straw or leaves as their roof (Figure 4.6). As previously stated by respondents in GI1, they do not even have adequate fishing gear, nor do any of the crab fishers have their own boat or fishing net.

In terms of the transportation system infrastructure, the respondents mentioned that they primarily depend on *rickshaws* (three-wheeled human haulers) or *vans* (another type of three-wheeled human hauler) to transport their catches. Thus, poor infrastructure, remoteness and poor transport facilities inhibit crab fishers from easy and expedient access to the markets. The result is that they sell their catch at the landing sites which paves the way for the buyer, or the *dadondar*, to gain bargaining power over them (Islam, 2011).

Figure 4.6: Typical household of crab fishers in coastal Bangladesh

Social capital: Social capital refers to social relationships between people that generate productive results (Smallbone, 2010; Ramirez, 2010; Kabir et al., 2012). It includes relationships with neighbors, the community and institutions at the local level such as the Union Council. These are important for livelihood strategies as different material and non-material benefits can be derived from these relationships (Islam, 2011). Social capital, in the form of networks, cultural norms and other social attributes, has significantly helped exchanges of experience, the sharing of knowledge and cooperation between rural households (Ahmed et al., 2010). The social conditions and networks of the crab fishers as a cohort were of interest in the current study. The field study findings revealed that the villages of the crab fishers are usually inhabited by hereditary low-caste minority groups (predominantly Hindu or Buddhist). They are disadvantaged in terms of social capital as they are usually neglected by and isolated from mainstream society, which adversely affects their livelihood and crab fishing as a profession. As stated by respondents, *"... we are [a] part of our society and we have the right to receive all the social benefits like others. But due to our profession and caste, we are kind of neglected in the society and are deprived from everything"* (GI2). Although social capital reduces community distress (Snowden, 2005), as a community, the crab fishers have been suffering due to unfavorable social beliefs. As a result, they do not have equitable access to social institutions, without whose support the conditions of the rural poor are unlikely to improve (Bosher, 2007). Community-level survival

strategies (e.g., neighborly assistance, community support) can provide a level of resilience that can reduce vulnerability. Thus, the effective utilization of this social capital can play an important role in reducing the vulnerability of the crab fishers.

As shown in the above discussion, it is evident that the crab fishers do not have adequate access to the basic necessities. They suffer from lack of adequate access to natural capital, physical capital, social capital, human capital and financial capital which make their livelihood unsustainable and open to threat. As discussed earlier, one of the key reasons for the unsustainable livelihood of the crab fishers is the existing long, cumbersome and supplier-dominated mud crab value chain which creates a great deal of suffering for the crab fishers and makes their livelihood unsustainable. Hence, change is required in the existing mud crab value chain.

4.4.3 Need for a Change in the Existing Crab Value Chain

It is evident that the crab fishers of coastal Bangladesh are highly dependent on crab catching for their livelihood and subsistence, even though their livelihood is poor and unsustainable. Crab fishers, as well as crab suppliers, desperately want relief from such vulnerable conditions. As they stated, *"it is necessary to bring [about] a change in the crab selling process and grading"* (GI4). Furthermore, the respondents mentioned that *"we hope that a favourable change can increase the demand for crab, more parties will be involved; [a] fair price and more earning[s] will be ensured through the crab business"* (GI1). *"We think there is a need for a third party or government influence who will help us to fight against the dishonest aratders or the local musclemen to protect us from their ill motives and exploitation"* (GI2). On the other side, the crab suppliers wanted to change the existing system to eradicate the dominance of the exporters. As they mentioned, *"if it is possible to change the route of export[s] from Dhaka to Chittagong, then we can avoid the exploitation of the exporters and reduce the cost of transportation and reduce the [crab] mortality during this time."* (GI3).

Cooperative as a last resort: From the previous discussion, it is evident that the existing mud crab value chain contributes to unsustainable conditions for the crab fishers. The value chain participants, especially the crab fishers, desperately feel the need for a change; however, they are neither aware of how to bring about a change

nor do they possess any influencing power to act as a change agent. As discussed in Chapter 2 'Literature Review', a handful of success stories about the role of a cooperative in the fishery value chain can be found in the existing literature. In order to develop the revised cooperative-based crab value chain structure, the researcher attempted to explore the views of existing channel members about a cooperative. The findings from the group interviews are discussed under the following headings:

Awareness about a cooperative: Both the crab suppliers and crab fishers are aware of cooperatives. The suppliers already have their own cooperative which primarily operates with a very limited scope, such as acting in a united manner to ensure the smooth transportation of goods and handling local miscreants who often ask for undue tolls, etc. As they mentioned, *"it [the cooperative] helps us on different issues like to solve any problem such as giving money or bribe[s] to police while transporting crabs from Chittagong to Dhaka".* Although the crab fishers are aware of cooperatives, few of them were treating local NGOs and the Grameen Bank (of Professor Yunus for microcredit) as cooperatives. Irrespective of whether they are crab suppliers or crab fishers, the crab channel members were largely ignorant of the potential of the operational scope of a cooperative. Except for the issue of a tiny monthly subscription to the cooperative, they, and to be specific, the crab fishers were unaware of what was involved in forming a cooperative.

4.4.4 Factors Influencing Adoption of a Cooperative

As discussed in Chapter 2 'Literature Review', the following factors influenced the adoption of a cooperative by the mud crab fishers: individual factors, channel factors, perceived benefits of cooperative, perceived barriers to a cooperative, social norms and personal norms. These factors are primarily driven by the social business concept. The previous literature (as presented in Chapter 2) provided a detailed account of these variables, how they are derived from the concept of the social business and how they contribute to the attainment of a sustainable livelihood for the crab fishers. This section presents empirical evidence in support of the relevance of these factors (individual factors, channel factors, etc.) with the respondents (crab fishers and crab suppliers) of the south-east (greater Chittagong division) and south-west (Khulna division) coastal regions of Bangladesh.

4.4.4.1 Individual factors

Individual factors represent the individual's positive or negative evaluation of performing the behaviour. In the field study, the researcher found support for the different components of individual factors, namely, skill, experience and involvement which were found to influence the individual's decision making. The role of individual factors is also highlighted in the social business concept. As mentioned in Chapter 2, to initiate a social business entity, it is recommended that individuals from the surrounding stakeholders be involved in a flexible way. Furthermore, the social business emphasizes an individual's existing ability, experiences and involvement in that entity (Yunus & Weber, 2010). The group interview respondents also indicated the relevance of the individual factors, with this discussed below.

Skill: In crab businesses, the crab fishers are the key people, and therefore their attributes and skills underpin the business. For the crab catching profession, the fishers' crab catching skill is the most important factor to continue the fishing. *"... we learn as we catch crab every day and, thus, we become skilled in catching crabs from different places. Even now we can understand the presence of crabs in a particular area"* (GI2). Again, respondents in GI1 mentioned that, "*… this crab catching skill keeps us still alive and earn[ing] for our livelihood. As we are doing this for [a] long time, we have become skilled and experienced in this profession".* The supporting quotes above are in line with the social business viewpoint, as the most significant determinants in initiating a business entity and continuing the respondents' profession are considered to be the skills of individuals. This is also outlined in Chapter 2.

Experience: Experience is an individual's observation of and/or interaction with objects, entities and/or events in her/his environment. Individuals with more experience in a specific task are significantly more likely to adopt a relevant innovation than individuals who are not experienced. The field study clearly revealed evidence of experience as a part of individual factors. For example, respondents in GI1 mentioned, "*I have 17/18 years' experience in crab catching. ... being experienced in this job, now I can realize the presence of crabs in a place …. Then I pull the crab out by the trap"* (GI1). In addition, the respondents in GI2 mentioned

that "*we have … huge practical experience of catching crabs from various swamps, canals, mangrove areas and selling those [o]n [a] daily basis helps us to sustain our livelihood"* (GI2).

Involvement: In the mud crab value chain, involvement refers to participation of the mud crab channel members in the existing trading and distribution system process. As presented in Table 2.5 (Chapter 2), the first and second social business lessons emphasize the value chain member's involvement along with his/her abilities to make the total process more accessible and useful for him/her. The involvement of channel members with the system is usually determined by the members' perception of the concept being relevant for their requirements. From the field study, it was found that *"… we receive our daily income by being involved with crab catching and then selling our catch to suppliers and others: without our involvement, no one would be able to help the suppliers with crabs"* (GI5).

4.4.4.2 Channel factors

Channel factors refer to factors inherent among the distribution channel members and characterize the salient features of the existing channel members. As per one of the key social business principles, the parties involved in the existing system will act under the cooperative paradigm instead of the conventional competitive paradigm (Yunus et al., 2010). Taking this social business principle into consideration, the proposed model focuses on cooperation between the channel members, instead of the current competitive mindset, so they can run the cooperative and reap its benefits. From the field study, the revealed channel factors towards the change were supplier influence, vertical conflict and horizontal competition between the channel members**.** Past studies (e.g. Kim, 2000; Benton & Maloni, 2005) have shown separate empirical evidence that each of these factors influences the performance of the channel members as well as the adoption of an innovation for the change.

Supplier influence: In supplier influence, channel members use coercive influence strategies with the exchange partners of a value chain as a means of promises, threats or legalistic requests in communication. In the mud crab value chain, often suppliers dominate crab fishers and exert direct pressure on them to perform a specific behaviour by emphasizing the adverse consequences of non-

compliance. It was found from the field study that *"the aratders [suppliers] are powerful due to their money and network ... they often try to cheat with us. ... they even sometimes give less quantity per kilo and not only that*; *... sometimes the suppliers capture our catch forcefully if we bargain with them for a better price. They usually give us half of the prevailing market price"* (GI1). Suppliers play a controlling role in the mud crab value chain and, more specifically, over the crab fishers for the exchange of crabs. This was also clear from the suppliers' interview when they said, *"[w]e gives dadon[s] [informal loans] to different parties mainly crab fishers to collect crabs in exchange for it ..."* (GI3).

Vertical conflict: Vertical conflict indicates the conflict or mismatch of opinion between two levels of partners in the value chain which may result in the exercise of channel power and in dysfunctional relationships between the value chain participants. In the existing mud crab value chain, crab fishers are influenced by the crab suppliers' power and are the target group for conflict with this described in the crab fishers' group interview. The respondents of the group interviews described some of the areas where the crab suppliers dominated the crab fishers and used their power over the crab fishers. For example, *"... sometimes the suppliers take all the crabs from us by force specially if we catch from the public /gov't spare lands"* (GI2); *"aratders use a tampered meter to weigh crabs resulting in about 30–40 gram[s] less in weight per crab), changes in the grade; and thus, variation in price of 150–200 taka [BDT] per crab"* (GI5). Suppliers said that "*we are unable to form a cooperative with the crab fishers due to various situational problems like they are too poor and opportunistic to work together"* (GI3).

Horizontal competition: Horizontal competition takes place between the members at the same level of a value chain. Although it is generally believed that competition increases efficiency and the probability of adopting a change, horizontal competition between the crab fishers contributes to their sufferings. Due to this competition, they cannot become united and the suppliers/*aratders* capitalize on this situation to dominate the crab fishers. As described by the respondents: *"we compete with each other so that we can sell our catches as soon as possible to any supplier"* (GI2). As the crab fishers are not currently united, they cannot bargain with the crab suppliers or *aratders*; instead, they must take the low price offered by the suppliers.

If the fishers can be united through a cooperative, as outlined in Table 2.2, Chapter 2, then the suppliers will be required to buy from the cooperative, as no one is going to sell to hem separately. By their united cooperative approach, the crab fishers can ensure a better price for the crab, selling to different parties through more bargaining which will simultaneously help to sustain their income.

4.4.4.3 Perceived benefits of a cooperative

As discussed in Chapter 2, the crab fishers, like other channel members, will become members of the cooperative under the proposed value chain, thus breaking out of the current exploitation trap created by the middlemen: the crab fishers will benefit by earning more. In addition, numerous income-generating activities through new experiments will be created by the cooperative, ensuring consistent income throughout the year for the crab fishers' family members as well as those of other channel members. This is in line with the social business concept. As stated earlier (Chapter 2), the social business, as a sub-set of the social entrepreneurship concept, favours social profit-oriented shareholders. It includes innovative links between all the stakeholders to attain a social mission in an innovative way (Mair & Marti, 2006; Yunus et al., 2010). Keeping this in mind, the crab fishers, like other channel members, by becoming members of the cooperative, will use the existing resources in a new way to pursue new opportunities so they can break out of the current exploitation trap created by the middlemen. The entire process will benefit the crab fishers who will earn more social wealth.

More income: One of the key advantages of a cooperative is its ability to generate higher income for the crab fishers than the existing mud crab distribution system/channel. Crab selling through the cooperative may help the members to assess the crab quality and quantity, undertake grading, set/negotiate the required price for the product and thus ensure more income with greater security for all channel members, which is not possible in the existing value chain practices. As mentioned by the respondents, *"every member should be profitable if we work under one umbrella like a crab cooperative and we (suppliers) will support the changing environment"* (GI3). Again, *"it is sure that if we do our activities like selling, buying, packaging etc. in the cooperative then it will bring more benefit for all the related parties involved in this business. It will increase our bargaining power to*

help to receive a better price than before as well as will increase our total income" (GI1).

Alternative income: The adoption of a cooperative in the mud crab value chain will enable the channel members to earn consistent income throughout the year. The cooperative is likely to open up job opportunities for alternative income for the crab fishers and their family members. This alternative income generation involving family members is in line with one of the lessons of the social business concept. Undertaking continuous strategic experimental schemes (in Chapter 2, Table 2.5) to run the social entity so it is self-sustaining and finding new ways for the cooperative to earn are prescribed lessons in the social business model. The crab business through the cooperative may provide a steady cash flow for the crab fishers, their family members and other channel members all year around through facilitating various alternative income-generating activities and experiments. Introducing a mud crab cooperative in the distribution channel will enable various experiments to be conducted, such as engaging the middlemen, crab catchers or family members of the crab fishers in different types of packaging for processed crab meat or, during the lean season, engaging them in making different types of bamboo baskets, net pots, etc. for safe transportation purposes. In the group interviews, the same views were expressed. *"If [the] cooperative helps 15–20 people to start a crab fattening project, that will be great to save the small crabs as well as more employment and thus more income will be generated from this sector"* (GI1). In the second phase, the *"cooperative can offer a different alternative job to the family members for [an] optional income-earning source in a cooperative manner and facilitate alternative income to the crab fishers"* (GI2).

Compatibility: The crab fishers' cooperative may be perceived as being consistent with the existing values, past experiences and needs of potential adopters which can positively convey its perceived benefits. This will take place if the existing channel members become involved in a coherent manner with the cooperative and its worth. This is in line with the double loop learning (Lesson 1, Table 2.4, in Chapter 2) of the social business model where a new strategy transforms its fundamental references to adopt a new system within the existing system if all the existing members find the new system useful for them. The group interview with the crab fishers revealed that *"... we think [a] cooperative will not*

change our current trading system a lot: instead of selling individually, we just need to sell through the cooperative" (GI1). In addition, the suppliers also revealed a similar opinion to the researcher: *"... it is necessary to change or revise the current crab trade system through [a] cooperative to create a central hub as a collection and selling centre for crab to minimize the cost and the risk of the business as [in] the previous one"* (GI6).

4.4.4.4 Perceived barriers to adopting a cooperative

The barriers to adopting a cooperative refer to the challenges that arise from its use, and thus are negatively related to its adoption. It is likely that the middlemen of the existing mud crab value chain will resist the adoption of a cooperative as it will threaten their current empires. In the field study findings, the dishonesty of the leaders of the cooperative, lack of trust between the channel members and lack of unity in caring for other members was found to be prevalent factors in the existing mud crab value chain. The social business concept proposes that the collaborative partnership (Dyer & Singh, 1998) is a key component (Yunus et al., 2010; Lesson 2, Table 2.4, Chapter 2); therefore, this will help to reduce the lack of trust between channel members and will have influence in building unity among them to overcome exploitation by local leaders and dominant channel members.

Dishonesty of the leaders of the cooperative: The respondents expressed fear of the possibility of the cooperative malfunctioning and not performing as expected and that it may fail to deliver the desired benefits. Crab fishers from the field study expressed their fear in this regard. *"[A] few influential suppliers attempt to create a monopoly, capitalizing their influence on others and try[ing] to keep other suppliers confined"* (GI6). From the suppliers, we found another scenario of dishonesty: "*we selected [a] few members from us to deal [with] all the transactions and negotiations with the exporters and the fishers. But they made liaison with the exporters to exploit us [suppliers and fishers] for their own profit"* (GI3).

Lack of trust: As discussed in Chapter 2 'Literature Review', trust enhances cooperation between the channel members and develops confidence in the exchange relationships. The social business also calls for collaborative partnerships with different organizations to leverage their knowledge, resources and expertise. In order to adopt a crab fishers' cooperative, the existing channel members will need to rely

on each other to mobilize their expertise for their mutual benefit and will have to create a trustworthy relationship with their peers (on the same level). Thus, one barrier to adopting a cooperative is the lack of trust between the existing channel members, and especially between the crab fishers and suppliers. This is clearly indicated in the information from the group interviews when it was stated that, *"[w]e cannot rely blindly on crab fishers for dadon; they may not give us the crabs in exchange, and they may return [to] us [a small] amount of loan and sell the crabs to other suppliers or to local markets for more benefit" (*GI3). On the other side, the crab fishers stated that *"we don't trust the suppliers; they usually cheat by tampering [with] the total weight and size of the crabs and thus exploit us"* (GI2).

Lack of unity: In an interdependent channel relationship, unity is the coordinated action between the members to achieve mutual outcomes. The current vulnerable situation of the crab fishers makes them less likely to achieve harmony and, as a result, the crab suppliers become more dominant over the crab fishers. To overcome the overriding role of the crab suppliers in the value chain, unity among the crab fishers is crucial. This is in line with the social business lessons that recommend the building of good partnerships through cooperation and unity to mobilize resources for overall progress (Dyer & Singh, 1998). A similar notion was also evident from the field study as the respondents mentioned: *"actually, the fishers are too vulnerable due to their unsustainable income and livelihood that they switch [from] one supplier to another too frequently for a better price" (*GI3). Again *"we are not united due to our insubstantial income and we do not have any mentality or patience to listen to one another" (*GI2) and *"we are unable to form a cooperative with the crab fishers due to various situational problems. Besides, they are too poor and opportunistic to work together"* (GI5).

4.4.4.5 Social influence

As the proposed cooperative will be a social business entity, its adoption and operations will be likely to be influenced by various people, such as peers, friends or family members. The social business encourages working with peers and thus recognizes social influence in initiating and running that business (Yunus & Weber, 2010), with this discussed in Chapter 2. The adoption of an innovation by an individual's peers, for example, superiors, colleagues and customers, may signal its

importance and advantages and thus influence that individual to adopt it as well. The field study findings have revealed two types of social influence, namely, family influence and peer influence.

Family influence: It is usually expected that an individual's adoption decision is influenced by his/her family members. This is also found to be applicable in the mud crab context as our group interview respondents mentioned that *"our family members support us in our daily activities and influence us to follow other fishers as [to] what they are doing" (*GI2).

Peer influence: An individual's adoption decision may also be influenced by his/her peers. On the similar note, adoption of a cooperative by the fishers is likely to be influenced by the fishers' peers. This is also evident from our group interviews. As they stated, *"if all other fishers think that [the] cooperative will work for our favour and join there, then I will be there with all for adopting [the] cooperative to sustain our livelihood"* (GI2).

4.4.4.6 Situational factors

Situational factors include the support received for the channel members from third parties, such as NGOs and the government. The decision by existing channel members to adopt a cooperative will be influenced by the availability of external support such as government and NGO support. To bring about a constructive change, as previously mentioned (Table 2.5, Chapter 2), the social business encourages the utilization of individuals' experiences and the partners' knowledge and involves stakeholders, such as the government and NGOs, to build and run the social business (Yunus & Weber, 2010).

Government support: The government could intervene with favourable tax policy, infrastructure support and funding schemes to promote crab-related entrepreneurship and mitigate current problems faced by the channel members. This was also evident from the group interviews. As stated by the respondents: *"if the government is interested in doing anything for the crab fishers through [a] cooperative that will bring a positive change like increase[ing] our bargaining power to get actual market price, decrease[ing] our loss by giving us different training and even… starting crab fattening project for us"* (GI2). Suppliers

expressed the view that, *"Government is careless and has no interest in this sector. For this reason, exporters are the king of this business and, do whatever they wish to determine the market price for crab as the final price"* (GI6).

> *We hope that the demand for crab will increase; more parties will be involved so that fair business will be ensured and thus we can earn more through a favorable change in the crab business. We think a third party or government influence is essential to make it happen which also will help us to fight against the dishonest aratders or the local musclemen from their ill motives and exploitation.* (GI1).

NGO support: In rural Bangladesh, different NGOs operate side by side with the government in support of a rural livelihood. Therefore, the likelihood of any potential adoption will be influenced by the extent of NGO support. This was also evident from the group interviews. As stated by the respondents, *"if the government or any NGO take[s] the initiative to form a crab fishers' cooperative, that will increase our bargaining power to get a reasonable market price for crabs and help us to [be] rescue[d] from the suppliers' depletion"* (GI1).

4.4.4.7 Attitude towards a fishers' cooperative

The attitude towards an object can be considered as a person's general belief and/or feeling of favourableness or unfavourableness towards that object that leads to their behaviour (Ajzen & Fishbein, 1980). The attitude towards a cooperative is likely to influence the positive intention to adopt a cooperative. The opinions of crab fishers and suppliers regarding their attitude towards a cooperative were: *"we hope that if we become ... member[s] of the cooperative, it will motivate the other farmers to become its member[s] immediately."* (GI1). And again *"it would be really good for us and for the crab fishers if the existing system is changed. It could be through establishing [the] cooperative but the government must take [the] initiative for this for more participation"* (GI4).

4.4.4.8 Intention to be engaged with a crab fishers' cooperative

Both *aratders* and crab fishers expressed the positive intention of accepting a cooperative in the existing crab value chain. However, instead of establishing a central cooperative that would take both *aratders* and crab fishers as members, they preferred that a cooperative be established at each channel level, that is, a separate

cooperative at the fishers' level as well as at the level of the suppliers or *aratders*. As the respondents mentioned,

> *it would be really good for us and for the crab fishers if the existing system is changed. It could be through establishing [a] cooperative but the government must take [the] initiative for this … Every member should be profitable if they work under one umbrella like a crab cooperative. We [suppliers] will support … the changing environment if the government take this initiative. … we are unable to form a cooperative with the crab fishers due to various situational problems. Besides, they are too poor and opportunistic to work together"* (GI3).

On the other hand, the crab fishers also expressed their opinion in favour of forming a cooperative for themselves. As they mentioned, *"we [crab fishers] will be the members of the cooperative but not the suppliers. If suppliers become members in our cooperative, they will start manipulating the situation on their behalf as they have got more money, power and network"* (GI1).

4.4.4.9 Expected benefits from a cooperative – perceived sustainable livelihood

Both crab fishers and the suppliers mentioned that the establishment of the cooperative will be helpful for their well-being. As the crab fishers mentioned,

> *If we are united through a cooperative, we will have more bargaining capacity and can control the supply of the crab. The aratders will be required to cooperate and listen to us … it will be easy to make various decisions to solve our problems in our favour if we become the member[s] and run the cooperative. If the suppliers or the aratders run the cooperative, they may not realize our problems and may not take [the] right action [at the] right time* (GI1).

Thus, the crab fishers expressed the view that a cooperative owned and run by them would be helpful for them in gaining bargaining capacity, receiving a more equitable price for their produce and, thus, eradicating the exploitation trap of the crab suppliers. Moreover, considering their unsustainable livelihood and lack of access to natural, human and social capital, the crab fishers would find it helpful for solving their social problems over time if the cooperative was governed under the social business philosophy. When asked, the crab fishers mentioned that they preferred to solve their social problems instead of reducing the profit from the

cooperative. Table 4.2 shows the summary of all the factors and variables derived from the field study.

Table 4.2: Factors derived from the field study

Factors	Variables	Group Interview (GI)					
		GI 1	GI 2	GI 3	GI 4	GI 5	GI 6
Individual Factors (IF)	Skill (IFS)	√	√		√		√
	Experience (IFE)	√	√	√		√	
	Involvement (IFI)	√	√	√			√
Channel Factors (CF)	Supplier Influences (CFSI)	√	√	√	√	√	√
	Horizontal Competition (CFHC)	√	√	√		√	√
	Vertical Conflict (CFVC)	√	√	√		√	
Perceived Benefits of a Cooperative (PBC)	More Income (PBCMI)	√	√	√		√	
	Alternative Income (PBCAI)	√	√	√		√	√
	Compatibility (PBCC)	√	√		√	√	
Perceived Barriers to a Cooperative (PB)	Dishonesty of Leaders (PBDL)	√	√	√		√	√
	Lack of Trust (PBLT)	√	√	√	√	√	
	Lack of Unity (PBLU)		√	√	√		
Situational Factors (SF)	Gov't Factors (SFGS)	√	√	√	√	√	√
	NGO Factors (SFNS)	√		√	√		
Social Influence (SI)	Peer Influence (SIPI)	√	√	√	√	√	√
	Family Influence (SIFI)	√	√	√	√	√	√
Attitude towards a Cooperative (ATC)		√	√	√	√	√	√
Intention to be engaged with a Cooperative (INC)		√	√		√		√
Perceived Sustainable Livelihood (PSL)		√	√	√	√	√	√

4.5 RELATIONSHIPS BETWEEN THE FACTORS

Table 4.3 below shows the relationships between the factors, as explored through the qualitative analysis. The indicated relationships between the factors as well as the

findings from the literature review suggest hints for the hypotheses formulation. The associations between the factors are discussed in this section.

Table 4.3: Relationships between the factors

Relationship	Participants					
	GI1	GI2	GI3	GI4	GI5	GI6
IF → PBC	√	√		√		√
IF → PB			√		√	
IF → ATC	√	√	√	√	√	√
CF → PBC			√		√	√
CF → PB	√	√	√	√	√	√
CF → ATC	√	√	√	√		
PBC → ATC	√	√	√	√	√	√
PB → ATC	√	√		√		
SI → ATC	√	√		√		
SI → INC	√	√		√		
SF → ATC	√	√	√	√	√	√
SF → INC	√	√	√	√	√	√
ATC → INC	√	√		√	√	
INC → PSL	√	√	√	√	√	√

Individual Factors (IF); Channel Factors (CF); Perceived Benefits of a Cooperative (PBC), Perceived Barriers of a Cooperative (PB); Situational Factors (SF); Social Influence (SI); Attitude towards a Cooperative (ATC); Intention to be Engaged with a Cooperative (INC); and Perceived Sustainable Livelihood (PSL).

Table 4.3 above has been developed from the findings of the field study data as presented in this section. The table establishes the relationships between factors extracted from the group interview findings. For example, the impression INC → PSL presents the relationship between INC (intention to be engaged with a cooperative) and PSL (perceived sustainable livelihood). All participants directly or indirectly indicated the importance of INC for attaining the PSL for the crab fishers. Respondents in GI3, for example, indicated that *"[w]e are solvent with this business, but the crab fishers are suffering very badly due to their inadequate resources and vulnerable income".* This was similarly expressed by a respondent in GI5: *"[w]e always try to help the crab fishers but that is not sufficient [for] their survival; they need more government help to start a fishers' cooperative to sustain ...."* indicating the relationships from ATC → INC with INC → PSL. Furthermore, the statement: *"Government support and other facility[ies] in this sector will not only help them but also indirectly initiate them to bring a radical change"* uses the relationships

from SF → ATC and SF → INC. From the content analysis, the extraction of the relationship between IF and PBC is worth mentioning. It is very significant that all field study respondents affirmed both the relationships between IF and PBC directly or indirectly and between PBC and ATC. Their perception was that if the fishers' cooperative started to work then all the existing problems could be removed day by day: as expressed by respondents in GI2, the fishers' livelihood will be sustainable if all the value chain participants worked under the one umbrella.*"* He added that: *"we [are] eagerly waiting for a change but getting no hope from anywhere".* It can be objectively deduced that the capacity to respond to the existing value chain situation will help the poor crab fishers to achieve sustainability. The relationship between CF and PB is based on the notion that crab fishers are willing to adopt a cooperative to eradicate the channel barriers, such as suppliers' influences, vertical conflict and horizontal competition. Thus, the channel factors are likely to influence the altitude of the crab fishers to adopting a cooperative. Similarly, extracting the relationship between SI and ATC has been expressed by the respondents. For example, caring about social trends and family influence also motivate the crab fishers to adopt the cooperative to bring about a rapid change in their daily business. They also show their intention and the relationship between SI and INC was also expressed. However, it was not possible to draw a relationship from direct comments, such as from IF → PB, although detailed data analysis was performed.

As presented in Table 4.3, several important relationships are observed among the perceived sustainable livelihood (PSL) components as explored by the content analysis. For example, the relationships from IF → PBC; IF → PB; CF → PBC and CF→ PB have been explored in this study. Besides, the relationships between PBC → ATC and PB → ATC have also been explored in this study.

4.6 REVISED MODEL BASED ON THE FIELD STUDY

The initial model for the research was presented and discussed in Chapter 2 (Figure 2.7). In this section, the revised model based on the field study data is shown in Figure 4.7. The revised model shows the new factors and variables and interrelationships between these variables which were found through the field study. Furthermore, it shows how the variables of the model are related to the social business concept (Yunus, 2009) and the theory of planned behaviour (TPB) (Ajzen,

1985). The variables of the revised model are derived primarily from these two theories. Furthermore, a summary table describing the variables derived from the social business concept is presented in Chapter 2 (Table 2.4). Some of the variables from the initial model are also dropped from the revised model as the field study showed that these variables were not relevant.

In the revised study model (Figure 4.7), the researcher found a few new variables (red marked items in Figure 4.7) in comparison to the initial research model presented in Chapter 2. Below is the list of the variables that were dropped in the revised model:

- Roles and responsibilities under individual factors
- Members' communication, members' cooperative attitude and members' commitment under channel factors
- Relative advantage, complexity, profitability and consistent income security under perceived benefits of a cooperative
- Perceived cost, perceived sacrifice, perceived risk and perceived resistance under perceived barriers to a cooperative
- Self-efficacy or confidence under situational factors.

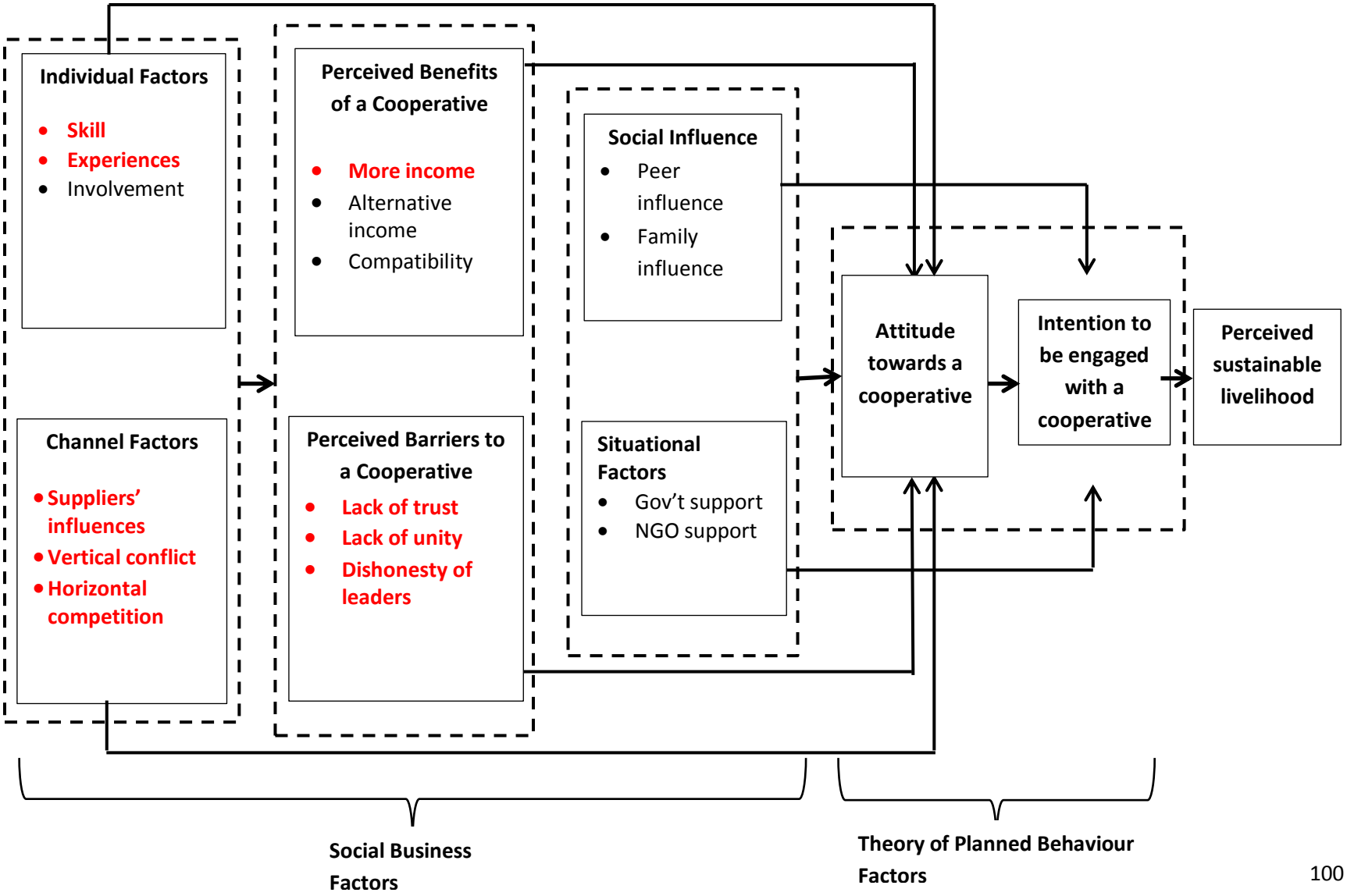
The above-mentioned variables were included in the initial research model based on the literature review. However, these variables were not directly mentioned by the group interviewees during the field study. For example, roles and responsibilities were covered under the concept of involvement; hence, it has been dropped in the revised model. In addition, the field interviews revealed a few new variables (as mentioned below) which have conceptual overlaps with the above variables.

The variables that are included based on the field study (Figure 4.7) are:

- Skill and experiences under individual factors
- Suppliers' influences, horizontal competition and vertical conflict under channel factors
- More income under perceived benefits of a cooperative
- Dishonesty of leaders of the cooperative, and lack of trust and lack of unity under perceived barriers to adopting a cooperative.

Figure 4.7: Revised research model (based on the concept of social business and theory of planned behaviour [TPB])

(Note: Red marked items are added based on field study)



The researcher considered members' communication, members' cooperative attitude and members' commitment while developing the initial model, as the key channel factors based on the literature in adopting a cooperative. However, during the field study, it was discovered that suppliers' influence, vertical conflict and horizontal competition were more prevalent in the field and thus outweighed the possible role of communication and a cooperative attitude between the members. Under the perceived benefits of a cooperative, more income has been included in the revised model as the respondents placed more emphasis on the level of their income to sustain their livelihood. Under perceived barriers, the crab fisher respondents raised more concerns about the possible dishonesty of the leaders, the lack of trust that they experienced towards the suppliers and the lack of unity that they had amongst each other than the variables (such as perceived cost, perceived sacrifice, perceived risk and perceived resistance) mentioned in the initial model.

4.7 JUSTIFICATION OF THE FIELD STUDY FINDINGS BASED ON THE LITERATURE REVIEW

Based on the literature review, this section provides the validation of the selected constructs and the variables developed from the field study. It is important to mention that the selected factors and variables in the field study were derived on the basis of commonality and consistency. Hence, this justification proves the competency and adequacy of each construct and variable in line with the literature. Table 4.4 presents the factors and the variables that have been finally selected with relevant literature support.

Table 4.4 Justification of the findings from literature sources

Constructs	Sub-constructs	References
Individual Factors **Social Business: Lessons 1 & 2**	Skill (IFS)	Pavlou and Fygenson (2006); Novak et al. (2000); Kang et al. (2013); Xu and Quaddus (2007); Thong and Yap (1995); Fini et al. (2012); Yunus and Weber (2010)
	Involvement (IFI)	Novak et al. (2000); Novak et al. (2003); Xu and Quaddus (2007); Yunus and Weber (2010)
	Experience (IFE)	Pavlou and Fygenson (2006); Agarwal

		and Prasad (1999); Karjaluoto et al. (2002); Rogers (1995); Xu and Quaddus (2007); Yunus and Weber (2010)
Channel Factors **Social Business: Lessons 1 & 2**	Suppliers' influence (CFSI)	Kim (2000); Frazier and Rody (1991); Brown et al. (1995); Frazier and Summer (1986); Frazier and Summer (1984); Angelmar and Stern (1978); Yunus et al. (2010)
	Horizontal competition (CFHC)	Thong and Yap (1995); Porter and Miller (1985); Thong (1999); Yunus et al. (2010)
	Vertical conflict (CFVC)	Benton and Maloni (2005); Coote et al. (2003); Yunus et al. (2010)
Perceived Benefits of a Cooperative Social Business: Lesson 3 & 4	Compatibility (PBC)	Rogers (1995); Moore and Benbasat (1991); Karahanna et al. (1999); Zolait (2010); Yunus et al. (2010)
	More income (PBCMI)	Rogers (1995); Moore and Benbasat (1991); Taylor and Todd (1995); Tornatzky and Klein (1982); Poon (2007)
	Alternative income (PBCAI)	Moore and Benbasat (1991); Poon (2007)
Perceived Barriers of a Cooperative **Social Business: Lessons 3 & 4**	Lack of unity (PBLU)	Carron and Brawley (2012); Wood (1999); Anderson and Narus (1990); Rindfleisch (2000); Anderson and Weitz (1992); Yunus et al. (2010)
	Lack of trust (PBLT)	Benton and Maloni (2005); Coote et al. (2003); Rindfleisch (2000); Tsai et al. (2010); Anderson and Narus (1990); Morgan and Hunt (1994); Andaleeb (1995)
	Dishonesty of leaders (PBDL)	Field Study
Social Influence **Social Business: Lesson 1**	Peer influence (SIPI)	Taylor and Todd (1995); Venkatesh and Brown (2001); Ajzen (1991); Kulviwat (2009); Yunus and Weber (2010)
	Family influence (SIFI)	Ajzen (1991); Fini et al. (2012)
Situational Factors **Social Business:**	Government support (SFGS)	Fini et al. (2012); Niosi and Bas (2001); Beck et al. (2005); Der Foo et al. (2005); Yunus and Weber (2010); Yunus et al. (2010)

Lessons 2 & 4	NGO support (SFNS)	Fini et al. (2012); Ajzen (1991)
Attitude towards a Cooperative		Ajzen and Fishbein (1980)
Intention to be engaged with a Cooperative Social Business: Lessons 3 & 4		Ajzen and Fishbein (1980); Yunus et al. (2010)
Perceived Sustainable Livelihood Social Business: Lessons 4 & 5		Ajzen and Fishbein (1980); Yunus et al. (2010)

4.8 SUMMARY

This chapter has presented the findings of the qualitative field study and has proposed a revised research model. The main objective of this field study was to test the applicability of the initial model proposed from the literature review. Qualitative data were produced from six group interviews conducted with crab fishers, crab suppliers, crab catchers, crab *aratders* and crab exporters of the coastal areas of Bangladesh. The qualitative field study data were analysed in the deductive phase by employing the content analysis technique. Factors and variables related to the field study data as well as the relationships between factors were explored and were further scrutinized in the light of the literature review. Based on the comparison between the conceptual model and the field study model, a revised model was developed. This revised model demonstrates the dimensions of and the relationships between the variables that are relevant to the adoption of a fishers' cooperative in the existing mud crab value chain of Bangladesh. In the next chapter (Chapter 5), the hypotheses are developed from this revised model, with these further examined with quantitative data (in Chapter 6).

CHAPTER 5

HYPOTHESES AND QUESTIONNAIRE DEVELOPMENT

5.0 INTRODUCTION

In Chapter 4, the revised research model derived from both the literature review and the qualitative field study has been illustrated. As pointed out earlier, this research has been conducted based on a mixed-methods approach. The initial proposed model has been revised based on the findings of the qualitative field study. The revised model is now tested through the quantitative study.

This chapter focuses on the development of hypotheses based on the relationships between the factors as depicted in the final revised research model (Figure 4.7 in Chapter 4). In addition, this chapter discusses questionnaire development especially the measurement items used in the survey instrument and their sources. The survey instrument facilitates the measurement of the constructs to test the developed hypotheses.

5.1 HYPOTHESES DEVELOPMENT

In this section, hypotheses reflecting the interrelationships between the main factors and constructs of the study are discussed. It is worth mentioning here that the hypotheses were derived based on the likelihood of adopting the proposed crab fishers' cooperative in the mud crab value chain. As discussed in Chapter 4 and shown in the revised model (Figure: 4.7), a fishers' cooperative has been proposed to enhance the sustainable livelihood of the crab fishers. Moreover, the crab suppliers already have their own cooperative (as discussed in Chapter 4). Although this research primarily focuses on how likely the crab fishers will adopt the proposed cooperative to enhance their livelihood, the hypotheses were formed taking the perspectives of both crab fishers and suppliers into consideration. Crab suppliers play a major role in the existing supply chain and immensely influence the crab fishers' decisions and livelihood. Hence, it is difficult to ignore the role of the crab suppliers when examining whether the crab fishers are likely to adopt a cooperative. Thus, it is necessary to understand how the crab suppliers will perceive the idea of adopting a cooperative in the existing mud crab value chain. Therefore, this research

aims to explore the attitudes and intentions of both crab fishers and suppliers towards the proposed fishers' cooperative as both parties are an integral part of the crab business in rural coastal Bangladesh.

5.1.1 Hypotheses regarding Individual Factors (IF)

Individual factors (IF) refer to different personal traits such as skill, experience, knowledge and involvement that are likely to influence the attitude of a person towards an object (Xu & Quaddus, 2007). Individual factors represent the positive or negative evaluation of an individual's behaviour. Individual factors influence the perception of an object and reflect an individual's beliefs towards the object in terms of whether it is associated with his/her personal lifestyle and/or is of value to him/her (Celsi et al., 1992). When consumers consider a certain issue to be more relevant to themselves, they tend to be more involved with that issue (Zaichkowsky, 1985; McQuarrie & Munson, 1992) and are likely to consider the issue before making any decision.

A considerable amount of research has provided empirical evidence that individual factor influence the perception of an individual towards an object or an innovation. For example, Davis (1989) showed evidence in support of the importance of individual characteristics/differences in predicting the perceived benefits from adoption of an innovation. The individual's existing characteristics, such as knowledge, are significant predictors of their purchasing behaviour and help to develop positive attitudes and behavioural intentions (Lee et al., 2011; Tan, 2011). Individual factors, such as skill, experience and involvement play a significant role in determining attitudes towards an object (Krueger et al., 2000; Fini et al., 2012). Kang et al. (2013) showed evidence that individuals' past experiences of owning organic products help them with the willingness to make further purchases even at higher prices. Other researchers, such as Shapero and Sokol (1982) and Souitaris et al. (2007) also reinforced these arguments showing that individual characteristics impact directly on attitudes.

The current research proposes the adoption of a crab fishers' cooperative to enhance the livelihood conditions of the crab fishers. As is evident from the existing research (discussed above), individual factors influence the perceived benefits of an

innovation and the attitude towards the innovation; therefore, the individual factors (IF) of crab fishers are likely to influence the crab fishers' perceptions of the benefits derived from a cooperative. Crab fishers' skills, previous experience of catching crab and involvement with the profession are essential to attain the benefits from the proposed crab fishers' cooperative. In a similar notion, these individual factors of the crab fishers are likely to influence their attitude towards a fishers' cooperative.

Adoption of an innovation (in this case, a cooperative) not only depends on the benefits perceived by the person as being derived from that object but also depends on the extent of the barriers that she/he is likely to experience. Barriers to an innovation refer to the complexities that arise from its use (Rogers, 1995) which are negatively related to its adoption. If the perception of benefits derived from a cooperative outweigh the risks or barriers associated with its adoption, then it is likely that the person will make a positive adoption decision (Damanpour & Schneider, 2006; Thong & Yap, 1995). In a similar vein, the crab fishers' existing skill, their past experience and direct or indirect involvement with crab catching and selling help them to predict the possible benefits and barriers derived from the adoption of a crab fishers' cooperative in the existing value chain. The barriers to adopting a fishers' cooperative in the crab value chain include dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among the channel members. Individual factors such as skill, experience and involvement, are likely to reduce the three perceived barriers, as identified above, to adopting a cooperative.

However, the individual factors of the crab suppliers may not be relevant to the adoption of a fishers' cooperative. The reason is that crab suppliers have their own cooperative and are less likely to support a crab fishers' cooperative as they do not wish to see the fishers united. As discussed in Chapter 2, the crab suppliers usually dominate the individual crab fishers (Ferdoushi et al., 2010); hence, they are likely to resist the adoption of a cooperative as it will help the fishers to be united and may hamper the suppliers' domination. In addition, suppliers already earn a consistent income and their livelihood is not under threat. The proposed cooperative is for the fishers' benefit; hence, the suppliers' individual factors are not relevant to obtaining any benefit from the fishers' cooperative. As argued earlier, this research proposes the cooperative for the crab fishers' benefit, with the cooperative to be run by the fishers' themselves. Hence, the barriers such as lack of trust and lack of unity

among the channel members, and dishonesty of the leaders of a cooperative are not related to the crab suppliers and are less likely to influence the attitude of the suppliers towards a cooperative. Based on the above argument, it is hypothesized that:

H1: Individual factors positively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers.

H2: Individual factors negatively influence the perceived barriers to adopting a cooperative for crab fishers but not for crab suppliers.

H3: Individual factors positively influence crab fishers' attitude towards adopting a cooperative but not of crab suppliers.

5.1.2 Hypotheses regarding Channel Factors (CF)

Channel factors (CF) refer to the inherent characteristics of a distribution channel and the relationships between the channel members (Benton & Maloni, 2005). Channel members' relationships emphasize a direct, long-term association, encouraging mutual planning and problem-solving efforts to achieve the channel members' overall target. The relationships between channel members are viewed as exploitative rather than accommodative based on the direct and influence strategies associated with them (Frazier & Summers, 1986). In the context of the crab distribution channel, as is evident from the qualitative study's findings, crab fishers depend heavily on suppliers' loans and/or financial assistance to meet their daily necessities. Zafar and Ahsan (2006) also supported this notion of crab fishers' dependency on crab suppliers. The fishers also compete with each other to sell their entire catch to the local crab suppliers. Hence, the channel factors comprise horizontal competition, supplier influence and vertical conflict. These factors make the environment unfriendly for all channel members.

Channel factors were found to have a significant influence on the perceived benefits of an innovation (Davis, 1989) and can impact on the adoption decision (Thong & Yap, 1995). The current literature supports the notion that higher levels of competition stimulate innovation adoption (Gatignon & Robertson, 1989; Frambach & Schillewaert, 2002). Exploitation within the distribution channel by the power of a specific partner may lead to conflict and under-performance (Benton & Maloni,

2005). Power has been found to have a significant influence on channel members' relationships, for example, in cooperation, commitment, trust, compliance, conflict and conflict resolution (Maloni & Benton, 2000). Moreover, existing research (Dwyer et al., 1987; Frazier & Rody, 1991) has argued that the lack of resources limits the development of relational norms among the channel partners, with this believed to be true and applicable in the mud crab channel context. The existing mud crab channel suffers from the scarcity of resources as well as lacking good relationships between the members. As a result, exchange relationships are exploitative in nature, and with vertical conflict and even horizontal competition, prevail in the existing mud crab value chain. As a significant contextual factor, trust remains absent in such a relationship. As a result, the fear increases that other exchange partners will act with opportunistic behaviour (Gundlach & Achrol, 1993; Kim, 2000) and the partners feel a lack of confidence, reliability and integrity in their fellow partners (Morgan & Hunt, 1994; Kim, 2000). Thus, channel factors are able to control or influence the decision variables of an associated channel member (Anderson & Narus, 1990) eventually influencing that channel member's attitude towards the adoption of an innovation. Therefore, channel factors in the mud crab value chain, such as supplier influence and vertical conflict, are likely to influence channel members' attitudes towards a cooperative.

As mentioned earlier, the existing mud crab value chain is characterized by the power and domination of the crab suppliers as well as by conflict between the crab fishers and crab suppliers (Ferdoushi et al., 2010). The effects of the suppliers' power and dominance and of the conflict between the crab fishers and suppliers may negatively influence the perceived benefit of adopting a crab fishers' cooperative. The effects of this power domination and channel conflict are supported by Maloni and Benton (2000) who provide evidence of the importance of power as a variable in the supply chain. Frazier and Rody (1991) also indicated that coercive strategies are inversely related to channel members' attitudes towards conflict resolution. In addition, as mentioned earlier, crab fishers suffer from a scarcity of resources which limits the development of norms by channel members of the mud crab value chain (Dwyer et al., 1987; Frazier & Rody, 1991). As a result, opportunistic behaviour is likely to be prevalent among the crab fishers which will reduce the perceived benefits and negatively influence their attitudes towards a cooperative. Therefore,

channel factors (CFs) are likely to dilute the perceived benefits and enhance the perceived barriers to adopting a cooperative.

In summary, based on the above, this thesis argues that channel factors, such as vertical conflict, horizontal competition and supplier influence are likely to negatively influence the perceived benefits of a cooperative; positively influence the perceived barriers to a cooperative; and negatively influence the attitude towards a cooperative for the crab fishers. However, as this research focuses on the adoption of a fishers' cooperative by the crab fishers, the role of channel factors, as discussed above, is less likely to influence the crab suppliers' judgement in relation to adopting a cooperative. Crab suppliers have their own cooperative, so they will not be immediately motivated to adopt the cooperative; however, their relationships and management dealings with other channel members are the main concern as well as predicting their attitude towards a cooperative. Based on the above arguments, it is hypothesized that:

H4: Channel factors negatively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers.

H5: Channel factors positively influence perceived barriers to a cooperative for crab fishers but not for crab suppliers.

H6: Channel factors negatively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.

5.1.3 Hypothesis regarding Perceived Benefits (PBC) and Attitude towards a Cooperative (ATC)

The attitude towards adoption of an innovation is influenced by its attributes such as the perceived benefits of that innovation (Rogers, 1995; Quaddus & Hofmeyer, 2007). Perceived benefits are the extent to which channel members believe that accepting an innovation or working with a new system will enhance the value chain's performance (Davis, 1989). In a similar vein, the decision to adopt a cooperative in the existing mud crab value chain is likely to be influenced by the perceived benefits of a cooperative and channel members' attitudes towards a cooperative. The mud crab value chain participants need to believe that working through a crab fishers' cooperative will enhance their performance.

As is evident from the qualitative field study, adopting a crab fishers' cooperative in the mud crab value chain may have three key benefits: generating an alternative income, generating more income and ensuring compatibility with the existing distribution system. The perceived benefits of earning more income and generating alternative income sources throughout the year are defined as the extent to which channel members believe that a crab fishers' cooperative would enhance their effectiveness in their daily income activities. Another notable benefit to be derived from a cooperative is compatibility. Russell and Hoag (2004) asserted that compatibility is an attribute of perceived benefits and is positively related to the adoption of a newly established information technology (IT) system in an organization. Similarly, the compatibility of the proposed fishers' cooperative will be likely to influence channel members' attitudes towards engagement with a cooperative. This benefit will bring the channel members mental comfort regarding their use of and dealings with the new system for their businesses. A cooperative may be perceived as consistent with the existing values and past experiences, thus conveying its relative compatibility with the existing system and contributing to its perceived benefits. Again, past research has shown that the perceived benefit factors of e-commerce influence the behavioural intention of online consumers through their attitudes (Davis, 1989; Taylor & Todd, 1995a; Pavlou & Fygenson, 2006). Hence, it can be assumed in the context of the current research that the perceived benefits of a fishers' cooperative will change channel members' behaviour through their change in attitude.

Consequently, this research proposes to establish a crab fishers' cooperative in the existing value chain to obtain a sustainable livelihood for the crab fishers. Considering that crab suppliers are already in an advantageous position over the crab fishers in the value chain (Chandra et al., 2012), the researcher argues that crab fishers will have a stronger attitude towards adopting a cooperative than the crab suppliers. Being a key dominant channel member, the crab suppliers' attitudes towards a cooperative are a key determining factor for establishing the fishers' cooperative. Therefore, the perceived benefits of a fishers' cooperative are likely to influence the fishers' attitude towards a cooperative but the suppliers may not have the same attitude towards adopting a fishers' cooperative. Hence, it is hypothesized that:

H7: Perceived benefits positively influence the attitude towards adopting a cooperative for crab fishers but not crab suppliers.

5.1.4 Hypothesis regarding Perceived Barriers (PB) and Attitude towards a Cooperative (ATC)

The adoption of an innovation or system may involve complexities (Rogers, 1995) which are negatively related to the adoption decision (Russell & Hoag, 2004). Frazier and Rody (1991) argued that channel members' perception and attitudes towards resolving conflicts between or among the channel members depends on the extent to which they feel it is effective to express and attempt to resolve underlying disagreements.

The adoption of the proposed fishers' cooperative in the existing mud crab value chain is no different to what is mentioned above. The complexities of adopting a cooperative are called 'perceived barriers'. The perceived barriers of a cooperative refer to consumers' perception of the uncertainty and possible undesirable consequences of adopting a cooperative in the mud crab value chain (Littler & Melanthiou, 2006). As identified in the qualitative field study, the perceived barriers of adopting a fishers' cooperative include dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among the channel members. Another perceived barrier is the performance risk of a cooperative which refers to the possibility of the cooperative malfunctioning, not performing as planned and therefore possibly failing to deliver the desired benefits (Grewal et al., 1994). The performance risk of the cooperative may also be linked with dishonesty of the cooperative's leaders that can retard the growth of the cooperative (Onje, 2003; Dimelu et al., 2014). Lack of trust between channel members is well reported by researchers as characterizing channel relationships (e.g. Morgan & Hunt, 1994; Coote et al., 2003). On the other hand, lack of unity was reported by the crab fishers in the qualitative field study, with this supported by the inter-organizational relationship literature that suggests that firms in horizontal alliances display lower levels of organizational trust as a result of lower interdependency and higher opportunism (Rindfleisch, 2000). These barriers are likely to negatively influence the crab fishers' attitudes towards adopting a cooperative in the existing mud crab value chain.

Existing channel members (especially the crab suppliers who are currently dominating the channel) will need to sacrifice their prevailing role once a cooperative is introduced in the mud crab distribution chain. Hence, they may be demotivated both to work in harmony with the crab fishers and to join the cooperative. Eventually, this may also negatively influence the fishers' attitude. This is based on the argument of the extant research on knowledge-based systems which reports that members will not be willing to adopt a new system if they face barriers and do not receive support from others, especially from the leader (Chen & He, 2003; Tsai et al., 2010). This indicates that the perceived barriers to adopting a fishers' cooperative will have less influence on the suppliers' attitude to adopting a cooperative. Therefore, it is hypothesized that:

H8: Perceived barriers negatively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.

5.1.5 Hypotheses regarding Social Influence (SI), Attitude (ATC) and Intention (INC)

The adoption of an innovation is influenced by consumers' perceptions of whether their behaviours are accepted, encouraged and implemented by others within their social surroundings. This social influence (SI) is often termed a subjective norm (Fini et al., 2012). The existing literature (Liker & Sindi, 1997; Lucas & Spitler, 1999; Thompson et al., 1991) has shown evidence that individuals' acceptance of new technology is positively influenced by their social surroundings and by the other people with whom they interact in society. Social influences are perceived as social pressures faced by an individual when deciding whether to behave in a certain way and these influences are internally controlled (Ajzen, 1991). The current literature has further suggested a positive relationship between social influences and intended behaviour and has shown that social influences stimulate behavioural intentions towards adoption (Karahanna et al., 1999; Pavlou & Fygenson, 2006).

In the context of adopting a cooperative in the mud crab value chain, channel members are likely to be influenced by their social surroundings. Here, subjective norms or social influence (SI) include the family's influence and peer influence of the channel members as crab fishers and suppliers face social pressure while deciding whether to adopt a cooperative in the existing value chain. This is also

supported by Fini et al. (2012), with the authors stating that the attitudes and surrounding subjective norms of small entrepreneurs can influence predictions of their corporate entrepreneurial intention. Armitage and Conner (2001) also confirmed the effect of attitude and social influence (SI) on intention through different psychology- and sociology-related theoretical and empirical results. Family influence refers to the individual's understanding of what his/her relevant family members think he/she should do and is concerned with the likelihood of those important referent individuals approving or disapproving of the performance of that given behaviour. Similarly, peer influence refers to the importance of the individual's understanding of what his/her relevant peers think he/she should do which is likely to have an influence on the individual channel member's use of a cooperative for the crab business.

The perception of social pressures influences the existing channel members regarding whether to engage in a crab fishers' cooperative and, thus, has a strong effect on adoption behaviour. As discussed above, social influence (SI) in the mud crab context includes family influence and peer pressure. Past studies have showed empirical evidence in support of the positive influence of familial and peer-based reference groups on an individual's adoption behaviour (Childers & Rao, 1992; Rosen & Olshavsky, 1987). The adoption of an innovation by an individual's peers, for example, their superiors, colleagues and customers, may signal the innovation's importance and advantages, thus, influencing that person to engage in the same intended behaviour.

This research emphasizes the adoption of a cooperative in the mud crab value chain to overcome the vulnerable livelihood condition of the crab fishers. Ideally, social influence (SI) is likely to affect the crab fishers' attitudes towards a cooperative. However, as the crab suppliers have their own cooperative, they are less likely to adopt the proposed cooperative. Hence, social influence (SI) is likely to influence the crab fishers' attitudes towards and intention to be engaged with a cooperative more than would be the case for the suppliers. Based on the above argument, it can be hypothesized that:

H9: Social influence has a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.

H10: Social influence has a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.

5.1.6 Hypotheses regarding Situational Factors (SF), Attitude (ATC) and Intention (INC)

The adoption of an innovation is also influenced by factors derived from the prevailing situation. Ajzen (1991) stated that perceived external environmental factors or perceived behavioural control are defined as a person's perception of how easy or difficult it would be for he/she to carry out the behaviour. The past literature has also illustrated the importance of external environmental support or situational factors (SF) in carrying out an adopted decision (Fini et al., 2009). The more support received by individuals, and the fewer obstacles or impediments they anticipate, the greater their perceived control over entrepreneurial behaviour (Armitage & Conner, 2001; Fini et al., 2012). For the existing mud crab value chain, the most crucial external support rendered to the crab value chain members is perceived to be government support and NGOs' support. Therefore, with the help of government and NGOs' support, the existing channel members will perceive a fishers' cooperative positively and will feel that it is easy to do business with the cooperative with a focus on its benefits. This in line with Pavlou and Fygenson (2006) who mentioned that a consumer's perceived ease or difficulty in obtaining product information from a vendor's website and in purchasing a product from a web vendor are influenced by external factors. For instance, the government could intervene with funding schemes and management policies aimed at mitigating market inefficiencies and promoting the crab sector for the rural crab fishers as well as for the crab suppliers (Lerner, 2000; Fini et al., 2012). In addition, in local contexts, physical infrastructure (Niosi & Bas, 2001; Fini et al., 2012), financial support (Beck et al., 2005) and training support have been shown to be fundamental in sustaining the crab fishers' livelihood. Thus, the likelihood of adopting a cooperative will be increased if support from the government and NGOs can be ensured. This is in line with Quaddus and Hofmeyer (2007) who mentioned that the government may play a supporting role when small organizations adopt new business-to-business (B2B) trading exchanges. Despite having said that, these situational supports are primarily directed towards crab fishers and not crab suppliers. As is evident from the field study, crab suppliers

are already self-sufficient, and their livelihood is not vulnerable. The government and NGOs have also offered to help the marginalized crab fishers. Hence, it is hypothesized that:

H11: Situational factors have a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.

H12: Situational factors have a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.

5.1.7 Hypothesis regarding Attitude (ATC) and Intention (INC)

The attitude towards an object can be considered as a person's general belief and/or feeling of favourableness or un-favourableness that leads to that person's behaviour (Ajzen & Fishbein, 1980). As suggested by the theory of planned behaviour (TPB), the intention to perform a specific behaviour is prior to the actual manifestation of the behaviour. In relation to the behavioural manifestation of making an adoption decision, the existing research (e.g. Rogers, 1995; Thong & Yap, 1995) has pointed out that a person's favourable or unfavourable attitude towards an innovation grows before making an adoption decision.

With regard to the adoption of an innovation, two major phases occur, namely, an initiation phase and an implementation phase (Damanpour & Schneider, 2009). These two phases of initiation and implementation are also relevant to adopting a cooperative. While the initiation phase is analogous to having a positive attitude towards a crab fishers' cooperative, the implementation phase reflects the intention to be engaged with that cooperative. As discussed earlier in this chapter, the attitude towards a cooperative is likely to be influenced by perceived benefits and perceived barriers of adopting a cooperative in the crab value chain. On the other hand, the intention to adopt an innovation captures the motivation of how hard people are willing to try so they can perform a behaviour (Ajzen, 1991). As this research focuses on the likelihood of crab fishers adopting a crab fishers' cooperative, the attitude towards a cooperative is likely to influence crab fishers' intention to be engaged with a cooperative for their daily crab transactions. However,

this intention may not be as strong for the crab suppliers as they are less likely to adopt a fishers' cooperative. Therefore, it is hypothesized that:

H13: The attitude towards a cooperative positively influences the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.

5.1.8 Hypothesis regarding Intention to be engaged with a Cooperative (INC)

The intention to be engaged with a cooperative refers to the mental state of existing channel members, especially the crab fishers, regarding the adoption of a cooperative in the mud crab value chain and carrying out everyday transactions with that cooperative. The intention of existing channel members to be engaged with a fishers' cooperative can be justified through the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980). According to the TRA, an individual's intention positively influences his/her behaviour. For this research context, the predictive behaviour after adopting a fishers' cooperative is a perceived sustainable livelihood as the research posits that adopting a fishers' cooperative will enhance the crab fishers' sustainable livelihood. On the other hand, the crab suppliers' livelihood is not under threat as they are the dominant channel member (Ferdoushi et al., 2010) in the value chain. Hence, it is hypothesized that:

H14: The intention to be engaged with a cooperative positively influences the perceived sustainable livelihood of crab fishers but not of crab suppliers.

5.1.9 Hypotheses regarding the Mediating Role of Perceived Benefits (PBC), Perceived Barriers (PB) and Attitude (ATC)

The mediation role of the perceived benefits of the adoption of a cooperative between individual factors and attitude towards a cooperative (ATC) is apparent in the past studies (e.g. Lai, 2013; Agarwal & Prasad, 1999). Moreover, the mediating role of perceived benefits in the relationship between channel factors and attitude is also documented in existing research (e.g. Damanpour, 1991, Frambach & Schillewaert, 2002). Again, Sweeney et al. (1999) and Mentzer et al. (2001**)** mentioned the mediating role of attitude between social influence (SI) and the

intention to adopt an innovation. Furthermore, Lai (2013) and Sluss et al. (2008) mentioned the mediating role of attitude between situational factors (SF) and intention. Therefore, encouraged by the previous literature, the current research has attempted to explore a series of mediating hypotheses regarding the mediating role of perceived benefits, perceived barriers and attitude. As crab fishers are the key focus in this study, the researcher chose to test the mediating hypotheses on the fishers' data only. The mediating hypotheses are discussed in the following sub-sections.

5.1.9.1 Mediating role of perceived benefits of a cooperative

In this section, the researcher discusses the rationale in support of the mediating role of the perceived benefits of a cooperative in the relationship between individual factors and attitude (ATC) towards adopting a cooperative. Numerous studies have found a positive relationship between individual factors and perceived benefits (Agarwal & Prasad, 1999, Xu & Quaddus, 2012, Lai, 2013). Again, the attitude towards adopting an innovation is influenced by different environmental or contextual factors, the characteristics of individuals and organizations that adopt the innovation, and the characteristics and attributes of the innovation itself (Rogers, 1995; Tornatzky & Fleischer, 1990; Damanpour & Schneider, 2006). Fini et al. (2012) also argued that entrepreneur's individual factors, such as skill, and personal abilities influence attitudes directly and entrepreneurial intentions indirectly.

In a similar way, the individual factors of the crab fishers may have a direct or indirect influence on their attitudes towards a cooperative. As hypothesized earlier, individual factors directly influence perceived benefits, and perceived benefits directly influence the attitude towards a cooperative (ATC). Considering that PBC are perceptions and/or beliefs relating to the advantages of a cooperative, these beliefs mediate the effects of different factors on the individual's decisions, which is in line with attitude theory (Fishbein & Ajzen, 1975). Based on the attitude theory, Frambach and Schillewaert (2002) also argued in support of the mediation effect of perceived innovation characteristics in the relationship of suppliers' and environmental variables with adoption behaviour. Chen et al. (2013) confirmed that the impact of technology readiness on continuance intention is mediated by the perceptions of usefulness, confirmation and satisfaction. It is apparent in the past studies (e.g. Lai, 2013; Agarwal & Prasad, 1999) that perceived benefits (e.g. ease of

us,; usefulness, etc.) fully mediate between the individual difference variables on attitude and usage intentions in the context of information technology (IT). Therefore, this research assumes that the perceived benefits of adopting a cooperative will play a significant mediating role between individual factors and attitude towards a fishers' cooperative (ATC). Hence, it is hypothesized that:

H15: Perceived benefits of a cooperative mediate the relationship between individual factors and the attitude towards a cooperative for crab fishers.

As mentioned earlier and revealed in the field study, channel factors (CF) include horizontal competition, vertical conflict and supplier influence, which are likely to have an impact on perceived benefits and perceived barriers (PB) of a fishers' cooperative in the existing mud crab value chain. This research further argues that PBC are likely to mediate the relationship between channel factors and the attitude towards a cooperative (ATC), as discussed below.

Channel factors are found to significantly influence the adoption and diffusion of an innovation (Lee et al., 2011; Belassi & Fadalla, 1998). Past studies (e.g. Davis, 1989) have mentioned that organizational factors influence the diffusion of a knowledge management system through the effects of its perceived benefits. Frambach and Schillewaert (2002) mentioned that the characteristics and advantages of an innovation mediate the effects of the suppliers' social network and other environmental influences on adoption behaviour. In addition, the perceived benefits of an innovation are also found to mediate the relationship between organizational factors and the attitude towards the innovation (Igbaria, 1993; Frambach & Schillewaert, 2002). The channel factors of this research, such as horizontal competition, vertical conflict and supplier influence, are similar to the organizational factors pointed out by Igbaria (1993) and Frambach & Schillewaert (2002). As hypothesized in the earlier sections, the channel factors of the mud crab value chain are likely to be directly linked with the perceived benefits of a cooperative and the crab fishers' attitudes towards a cooperative. However, we hypothesized a negative relationship between CF (channel factors) and PBC (perceived benefits), whereas PBC is hypothesized to have a positive relationship with ATC (attitude). Although the mediation of PBC in the relationship between CF and ATC may not work due to

this divergent direction of the relationship, the components of the channel factors (i.e. horizontal competition, vertical conflict and supplier influence) may work differently; that is, they may not be negatively related to the PBC of a cooperative if these components are examined in isolation. This research argued earlier (under H4, H5, H6) that channel factors negatively influence the perceived benefits of a cooperative (PBC) primarily due to the lack of relational norms in the relationship between fishers and suppliers and the existence of the fishers' opportunistic behaviour. However, it is likely that some fishers may perceive a higher level of benefits in a cooperative due to: (i) high supplier influence; (ii) high competition among the fishers (horizontal competition); or even due to (iii) high conflict with the suppliers (vertical conflict). In such a situation, that specific component of channel factors will positively influence the PBC (instead of the negative influence as hypothesized in H3). If this component is dominant over other components in forming the channel factors, then the overall effect of CF on the PBC may become positive; hence, the mediation of the PBC between CF and ATC is likely to occur. Based on the above arguments, it is hypothesized that:

H16: Perceived benefits of a cooperative mediate the relationship between channel factors and the attitude towards a cooperative for crab fishers

5.1.9.2 Mediating role of perceived barriers to adopting a cooperative

Min and Mentzer (2004) pointed out that trust, cooperation and management support are preconditions for a firm to share risks and information with its supply chain partners. In addition, perceived risk was found to play a mediating role in relationships between the perceived product and service quality and value for money (Sweeney et al., 1999). Agarwal and Teas (2001) mentioned that performance risk mediates between the relationship of quality and price. In generic terms, the above findings connote that perceived risk mediates the relationship between perceived attributes of the product and the individual's behaviour. The perceived risk of adopting an innovation is a somewhat similar notion to that of the barriers to adopting an innovation as both the concepts (risk and barriers) are deterrents to such an adoption. Therefore, it is likely that barriers to adoption will mediate the relationship between product attributes and behaviour or the attitude towards a specific outcome.

In a similar vein, the researcher argues that the perceived barriers of adopting a cooperative will mediate the relationship between channel members' attributes, that is, channel factors and the attitude towards adopting a cooperative (ATC) in the value chain. The Literature Review and the Field Study chapters of this thesis reveal that possible barriers to establishing a fishers' cooperative in the existing mud crab value chain include dishonesty of the cooperative's leaders, and lack of trust and lack of unity among the channel members. Earlier, in Chapter 5, it was hypothesized that perceived barriers are positively influenced by channel factors (H5), whereas perceived barriers negatively influence the attitude towards a cooperative. However, as in the above argument (under H16), the components of channel factors (supplier influence, horizontal competition and vertical conflict) may negatively influence the perceived barriers to adopting a cooperative, if the components of channel factors are examined separately. The reason is that, due to the persistence of the channel factors (supplier influence, horizontal competition and vertical conflict), some crab fishers may perceive barriers to adopting a cooperative (dishonesty of leaders of the cooperative, and lack of trust and lack of unity among channel members) as obvious; hence, the channel factors for these fishers will negatively influence the perceived barriers to adopting a cooperative. The link between perceived barriers and the attitude towards a cooperative will still be negative. As the direction of the relationships between the links of (a) channel factors and perceived barriers; and (b) perceived barriers and attitude are the same, it is likely that perceived barriers may mediate the relationship between channel factors and the attitude towards a cooperative. Hence, it is hypothesized that:

H17: Perceived barriers to adopting a cooperative mediate the relationship between channel factors and the attitude towards a cooperative for crab fishers

5.1.9.3 Mediating role of attitude

When making a decision, individuals often think about the perceptions of the significant others in their lives regarding that decision, such as whether their significant others think a certain behaviour should be performed. This phenomenon is termed a subjective norm, with significant others, such as peers, teachers, etc.

having been found to shape university students' use of technology (Margaryan & Littlejohn, 2008). In generic terms, subjective norms are the opinions of others who are close to and important to an individual and who maintain influence over decision making which affects an individual's behaviour to perform or not to perform an action (Kim et al., 2013). A subjective norm is considered to be one of the key elements of the theory of planned behaviour (TPB), providing a useful tool to predict a wide range of behaviours in many different studies, such as in the hospitality literature (e.g. Quintal, Lee, & Soutar, 2010) and in studies on product purchase behaviour (Dean et al., 2008; Kim et al., 2013). Hsu (2012) found that the more advantageous the attitude and the subjective norm related to a behaviour, the stronger the individual's intention to perform the behaviour. This indicates the possible mediating role of attitude in the relationship between the subjective norm and behaviour or behavioural intention. Kim et al. (2013) found empirical support for the full mediating effects of attitude towards behaviour when clearly demonstrating that consumers' subjective norms produce a favourable behavioural intention, with this being consistent with previous studies (supported in Chang, 1998; Han et al., 2010; Ryu & Jang, 2006; Taylor & Todd, 1995).

In a similar vein, the attitude towards and the intention to adopt a cooperative in the existing mud crab value chain are likely to be influenced by the view of others, such as the perceptions of family and peers, with this already hypothesized earlier under H9 and H10. Based on the above arguments relating to the mediating role of attitude in the relationship between subjective norms (i.e. social influence) and the adoption decision, this thesis posits that the attitude towards a cooperative mediates the relationship between social influence and the intention to be engaged with a cooperative. Therefore, the next hypothesis is:

H18: The attitude towards a cooperative mediates the relationship between social influence and the intention to be engaged with a cooperative for crab fishers

As pointed out in Chapter 2, another important variable that influences purchase decisions and/or behavioural intention is the perceived ease or difficulty of performing the behaviour, which is termed perceived behavioural control (Ajzen, 1991; Paul et al., 2016). Furthermore, Zhou et al. (2013) mentioned behavioural

control and/or individuals' ability to perform behaviour. Perceived behavioural control may include various situational factors such as resources (Ajzen, 1989); opportunities (Ajzen, 1989); and facilitating factors (Triandis, 1989) that facilitate or inhibit individuals' ability to perform a behaviour, thus affecting the performance of that behaviour. In the context of the adoption of a cooperative in the mud crab value chain, these situational factors or perceived behavioural control factors include Government support and NGO support towards the marginalized crab fishers, which enhances their ability to deal with their ongoing vulnerability.

Perceived behavioural control has been found to be positively linked with intention in various research contexts, such as recycling (Taylor & Todd, 1995); conservation (Albayrak et al., 2013); energy and carbon literature of hotel employees (Teng et al., 2014); organic foods (Tarkiainen & Sundqvist, 2005); and green products in general (Moser, 2015; Paul et al., 2016). Such situational influence can change an individual's attitude towards performing that behaviour. Considering that attitude is the degree to which a person has a favourable or unfavourable evaluation of a specific behaviour (Ajzen, 1991) and that this includes the perceived consequences associated with that behaviour (Ramayah et al., 2010), it is likely that the facilitating situational factors in the mud crab value chain (i.e. Government and NGO's support) positively influence the crab fishers' attitude towards a cooperative which eventually is likely to influence their intention to adopt the cooperative. This means that attitude is likely to mediate the relationship between situational factors (i.e. Government and NGO's support in the context of this research) and behavioural intention. Therefore, it is hypothesized that:

H19: The attitude towards a cooperative mediates the relationship between situational factors and the intention to be engaged with a cooperative for crab fishers

5.2 SUMMARY OF THE DEVELOPED HYPOTHESES

In this chapter, a total of 19 hypotheses (14 hypotheses related to direct relationships; and five related to mediating relationships) have been presented, reflecting the relationships between the variables shown in the revised model in Figure 4.7

(Chapter 4). Table 5.1 below presents the direct hypotheses (H1 to H14) developed earlier in this chapter along with their sources in the key supporting literature.

Table 5.1: Summary of direct hypotheses and their sources

SL No.	Links	Hypotheses	Supporting Sources
H1	IF → PBC	Individual factors positively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Karjaluoto et al. (2002); Souitaris et al. (2007); Novak et al. (2000)
H2	IF→ PB	Individual factors negatively influence the perceived barriers to a cooperative for crab fishers but not for crab suppliers.	Xu and Quaddus (2012); Fini et al. (2012); Rogers (1995); Armitage and Conner (2001)
H3	IF→ATC	Individual factors positively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.	Krueger et al. (2000); Fini et al. (2012); Souitaris et al. (2007)
H4	CF→PBC	Channel factors negatively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Benton and Maloni (2005); Frazier and Summers (1986); Maloni and Benton (2000)
H5	CF→PB	Channel factors positively influence the perceived barriers to a cooperative for crab fishers but not for crab suppliers.	Benton and Maloni (2005); Brown et al. (1995); Maloni and Benton (2000); Field study
H6	CF→ATC	Channel factors negatively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.	Benton and Maloni (2005); Hibbard et al. (2001); Frazier and Rody (1991); Kim (2000); Morgan and Hunt (1994); Anderson and Narus (1990)
H7	PBC→ATC	Perceived benefits positively influence the attitude towards adopting a cooperative for crab fishers but not for crab suppliers.	Davis (1989); Taylor and Todd (1995a); Pavlou and Fygenson (2006); Russell and Hoag (2004)

H8	PB→ATC	Perceived barriers negatively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.	Dimelu et al. (2014); Morgan and Hunt (1994); Coote et al. (2003); Russell and Hoag (2004)
H9	SI→ATC	Social influence has a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.	Karahanna et al. (1999); Pavlou and Fygenson (2006); Fini et al. (2012); Xu and Quaddus (2012)
H10	SI → INC	Social influence has a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.	Ajzen and Fishbein (1980); Childers and Rao (1992); Rosen and Olshavsky (1987)
H11	SF →ATC	Situational factors have a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.	Ajzen (1991); Fini et al. (2009); Pavlou and Fygenson (2006); Lerner (2000)
H12	SF → INC	Situational factors have a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.	Fini et al. (2012); Niosi and Bas (2001); Quaddus and Hofmeyer (2007)
H13	ATC → INC	The attitude towards a cooperative positively influences the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.	Premkumar and Ramamurthy (1995); Quaddus and Hofmeyer (2007); Ajzen and Fishbein (1980)
H14	INC → PSL	The intention to be engaged with a cooperative positively influences the perceived sustainable livelihood of crab fishers but not of crab suppliers.	Ajzen and Fishbein (1980); Childers and Rao (1992); Roy and Chan (2012)

5.3 QUESTIONNAIRE DEVELOPMENT FOR THE FINAL SURVEY

A questionnaire (Appendices 5.1 and 5.2) was developed in the light of the relevant literature, theoretical support and the field study outcomes to enable this research to collect survey data. The developed questionnaire was approved by the Curtin University Human Research Ethics Committee. The next section presents the development of the questionnaire in detail.

5.3.1 Overview of the Questionnaire

During the questionnaire development, careful attention was paid to item selection. For each construct, multiple items were considered to ensure reliable and valid measurement of the model. The first step was the extensive literature review of previously developed instruments to identify whether items could be adapted, adopted or needed to be developed for each construct. In addition, the items developed from the field study outcomes were reviewed and integrated into the questionnaire to contextualise the objects and to ensure content validity. The developed questionnaire was then subjected to a pre-test for necessary refinement. Chapter 3 detailed the pre-test procedure. Finally, the questionnaire was developed to collect the survey data for testing the proposed research hypotheses presented in the revised model, as shown in Figure 4.7 in Chapter 4. The sample questionnaires for both crab fishers and suppliers are shown in Appendices 5.1 and 5.2.

The questionnaire was separated into three sections comprising a total of 96 questions (excluding the demographic questions). A six-point Likert scale, which is suitable to avoid the bias of selecting the midpoint (Rossi et al., 1983), was used to design the questionnaire. The first section of the questionnaire included individual factors; channel factors; attitude towards a fishers' cooperative; perceived benefits of a cooperative; perceived barriers to adopting a cooperative; and social factors that might influence the adoption of a cooperative. The second section included the antecedents of situational factors that might influence the adoption of a cooperative, the intention to be engaged with a cooperative and the perceived sustainable livelihood of the crab fishers. The third section was comprised of the demographic information of the crab fishers and the crab suppliers in the research area.

5.3.2 Measurements

It was mentioned earlier that, excluding the demographic questions, there were 96 items in the measurement instrument. Among the 96 items, 72 items were operationalized as formative and the remaining 24 items as reflective, based on the decision rule suggested by Jarvis et al. (2003). The details about formative and reflective measurement decision criteria were discussed in Chapters 3 and 6.

5.3.2.1 Questionnaire – Section 1:

This section comprised the measurement items with respect to the antecedents of individual factors; channel factors; attitude towards a fishers' cooperative; perceived benefits of the cooperative; perceived barriers to adopting the cooperative; and social factors that might influence the adoption of a cooperative.

The construct 'individual factors' reflects the ability of an individual engaged with the mud crab sector of Bangladesh to carry out their regular activities. It has been measured by three variables: skill, experience and involvement of that individual (IFS1 to IFS5, IFE1 to IFE3 and IFI1 to IFI4). The measured scale items were mainly derived from Novak et al. (2000); Pavlou and Fygenson (2006); Quaddus and Hofmeyer (2012); Kang et al. (2013); Looi (2005); Zolait (2010); Rogers (1995); Novak et al. (2003); Igbaria et al. (1997); and Jackson et al. (1997), and then contextualised based on the field study findings.

The construct 'channel factors' reflects the relationship status between the channel members and their influence on each other in the existing mud crab value chain of Bangladesh. Channel factors consist of supplier influence, vertical conflict and horizontal competition of that channel. They have been measured by the scale items of CFSI1 to CFSI7, CFVC1 to CFVC7 and CFHC1 to CFHC3, respectively. The measured scale items for supplier influence were mainly derived from Kim (2000); Frazier and Summer (1986, 1984); Frazier and Rody (1991); Brown et al. (2005); Angelmar and Stern (1978); and Tedeschi et al. (2011). The item scale for vertical conflict was replicated from Benton and Maloni (2005); Coote et al. (2003); and Anderson and Narus (1990). Horizontal competition was measured from the scale items used by Quaddus and Hofmeyer (2007); Thong and Yap (1995); Kuan and Chau (2001); Thong (1999); and Porter and Miller (1985). Finally, all the measured scale items were checked in the field study and contextualised as per the field study observation and finalised.

The construct 'attitude' refers to the motivation towards a perceived behaviour and shows the positive or negative craving of a person towards that intended behaviour. Here, the attitude towards a fishers' cooperative has been measured through five scale items from ATC1 to ATC 5. These items were mainly

derived from previous studies (Zolait, 2010; Taylor & Todd, 1995a; Verbeke & Vackier, 2005). These items were mainly obtained from the field study with support from the literature also ascertained.

The construct 'perceived benefits' of an adoption decision reflects the inherent benefits and good features perceived to be derived from a new innovation or change, such as adopting a fishers' cooperative in the existing mud crab value chain. This was measured by more income, alternative income and the compatibility of the fishers' cooperative. The scale items were PBCMI1 to PBCMI6 for more income, PBCAI1 to PBCAI4 for alternative income and PBCC1 to PBCC3 for compatibility. The items for more income were derived from the previous research (Rogers, 1995; Nasri, 2011; Poon, 2007; Taylor & Todd, 1995a; Tornatzky & Klein, 1982). For alternative income, the source of the items was the field study. Compatibility was measured through items which derived from past studies (Rogers, 1995; Zolait, 2010; Tan & Teo, 2000; Karahanna et al., 1999; Moore & Benbasat, 1991). All the scale items were cross-checked with the field study items so they could be contextualised and finalised for the study.

The construct 'perceived barriers' means the possible obstacles which hinder, make delays or create confusion in the user's mind when making a decision involving change towards developing the intended attitude for adopting a cooperative in the existing mud crab value chain. Perceived barriers were measured by the dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among the existing channel members in the value chain. Here, dishonesty of the leaders of the cooperative were measured with scale items PBDL1 to PBDL4 and derived from the past literature (Dimelu et al., 2014, Morgan & Hunt, 1994). Lack of trust was measured by the scale items of PBLT1 to PBLT which were sourced from past studies (Benton & Maloni, 2005; Coote et al., 2003; Morgan & Hunt, 1994). The scale items for the lack of unity were sourced from the group interview schedule. All these scale items were contextualised through the field study analysis for the perceived barriers to adopting the fishers' cooperative.

The construct 'social influence' reflects the surrounding people and external others of an individual with whom they interact in society. It was measured by family influence and peer influence. The scale items for family influence from SIFI1

to SIFI3 were taken from the previous literature (Taylor & Todd, 1995; Venkatesh & Brown, 2001; Beedell & Rehman, 1999, p. 169; Ajzen, 1991) and the items for peer influence from SIPI1 to SIPI4 were derived from past studies (Taylor & Todd, 1995; Venkatesh & Brown, 2001; Ajzen, 1991). All the items were cross-checked with the field study findings and contextualised based on the observation for this study. Table 5.2 below shows the detailed list of all items corresponding to the constructs and their relevant literature sources.

Table 5.2: Measurement items and related statements of IF, CF, ATC, SI, PBC and PB

Individual Factors(IF)	Dimension	Statements	Sources
IFS1	Skill	I am skilled at crab fishing.	Novak et al. (2000); Pavlou and Fygenson (2006); Quaddus and Hofmeyer (2007); Kang et al. (2013); Looi (2005); Zolait (2010);
IFS2	Knowledgeable	I consider myself knowledgeable about crab fishing.	
IFS3	Know less than others	I know less than most other fishers about crab fishing. (R)	
IFS4	Know-how	I know how to catch crab in different seasons.	
IFS5	Familiar	I am quite familiar with crab fishing.	
IFE1	Good experience	I have good experience in crab fishing.	Zolait (2010); Rogers (1995); Field Study
IFE2	Experienced	I am experienced in crab catching.	
IFE3	Long-time involvement	I have been involved in crab fishing for a long time.	
IFI1	Involved in all aspects	I am involved in all aspects of crab fishing.	Novak (2003); Xu and Quaddus (2012); Igbaria et al. (1997); Jackson et al. (1997)
IFI2	More/less involvement	I am more involved in crab fishing than other activities.	
IFI3	Regularity	I catch crab on a regular basis.	
IFI4	Importance	Crab fishing is an important part of my life.	
Channel Factors (CF)			
CFSI1	More market information	The supplier has more market information than us.	Kim (2000); Frazier and Summer (1986); Frazier and Rody
CFSI2	Useful information	The information that suppliers provide us is useful.	

CFSI3	Rely on suppliers' information	We have to rely on the information provided by the suppliers.	(1991); Frazier and Summer (1984); Brown et al. (2005); Angelmar and Stern (1978); Tedeschi et al. (2011); Field Study
CFSI4	May not get loan	The supplier may not give us a loan if we don't follow their requests.	
CFSI5	Difficult negotiation	Negotiating price with the supplier is very difficult for us.	
CFSI6	Tinkered weighing machine	Suppliers often use a tinkered weighing machine while weighing raw crab.	
CFSI7	Recover their system loss	Suppliers often try to recover their system loss by paying less on total weight for the raw crab.	
CFVC1	Assistance	We do not like what the suppliers do in the name of assistance through loan advances.	Benton and Maloni (2005); Coote et al. (2003); Anderson and Narus (1990); Field Study
CFVC2	Interest consideration	Suppliers do not consider our interest in negotiating a fair price.	
CFVC3	Accurate weight	Suppliers prevent us from obtaining accurate weight of the crab.	
CFVC4	Do not have best interests	Suppliers do not have our best interests at heart.	
CFVC5	Disagree with suppliers	We disagree with suppliers on critical issues (e.g., fair price, correct weight)	
CFVC6	Rarely in agreement	We are rarely in agreement with the suppliers in day-to-day transactions.	
CFVC7	Tense relationship	We have a tense relationship with the suppliers.	
CFHC1	Compete with each other to sell	We often compete with each other to sell our catch to the same supplier.	Quaddus and Hofmeyer (2007); Thong and Yap (1995); Kuan and Chau (2001); Thong (1999); Porter and Miller
CFHC2	Compete with each other to buy	Suppliers compete with each other regarding from which crab fishers they will buy the raw crab.	

CFHC3	More fishers than suppliers	There are lot more crab fishers than suppliers in this area.	(1985); Field Study
Attitude (ATC)			
ATC1		Establishing a fishers' cooperative will be a better alternative than the existing system.	Zolait (2010); Taylor and Todd (1995a); Verbeke & Vackier (2005)
ATC2		I think it will be good for me to sell our crab through a cooperative.	
ATC3		I think a cooperative will help us to sustain our profession.	
ATC4		Engaging with a cooperative will not be trustworthy for us. (R)	
ATC5		In my opinion, it is desirable to be involved with a cooperative for our own benefit.	
Perceived Benefits of the Cooperative (PBC)			
PBCMI1		A crab cooperative can provide us with a secure income.	Rogers (1995); Nasri (2011); Poon (2008); Taylor and Todd (1995a); Tornatzky and Klein (1982); Field Study
PBCMI2		Crab selling through a cooperative will be more convenient for us than the conventional system.	
PBCMI3		I will be able to receive a better price than before if I sell crab through a cooperative.	
PBCMI4		I believe selling through a cooperative is a better idea to earn more income.	
PBCMI5		I think I will receive a fair price if I sell crab through a cooperative.	
PBCMI6		I believe selling through a cooperative will help us to get rid of the dominance of the suppliers.	

PBCAI1		A cooperative will generate new employment opportunities for our family members.	Field Study
PBCAI2		A cooperative will enable us to earn money from alternative sources for new crab-based products.	
PBCAI3		A cooperative will help us to be employed all year around.	
PBCAI4		A cooperative will assist us to produce supporting products related to crab marketing.	
PBCC1		A cooperative will be compatible with the existing crab value chain.	Rogers (1995); Zolait (2010); Tan and Teo (2000); Karahanna et al. (1999); Moore and Benbasat (1991);
PBCC2		Working through a cooperative will not change my crab fishing activities.	
PBCC3		Selling through a cooperative will fit well with my daily work style.	
Perceived Barriers to Cooperative (PB)			
PBDL1		I fear that the leaders of the cooperative may act dishonestly.	Field study; Dimelu et al. (2014), Morgan and Hunt (1994)
PBDL2		I fear that the leaders of the cooperative might influence the situation for their own profit.	
PBDL3		I am afraid that the leaders of the cooperative may double-deal.	
PBDL4		I am afraid that the leaders of the cooperative may misuse their power.	
PBLT1		The crab suppliers are not concerned about our welfare.	Benton and Maloni (2005); Coote et al. (2003); Morgan and Hunt (1994)
PBLT2		The crab suppliers are honest and truthful. (R)	
PBLT3		Promises made by the crab suppliers are unreliable.	
PBLT4		The crab suppliers have a low	

		degree of integrity.	
PBLT5		I have great confidence in the crab suppliers. (R)	
PBLU1		We do not have any unity among us.	Field Study
PBLU2		We are seldom in consensus about any issue.	
PBLU3		We rarely keep our agreement among ourselves for selling crab.	
PBLU4		We do not have any teamwork for improving our livelihood.	
PBLU5		We cannot work in a team with suppliers.	
PBLU6		The suppliers usually cooperate with us. (R)	
PBLU7		The suppliers usually disregard our opinion about an issue of common interest.	
Social Influence (SI)			
SIPI1		I will join in the cooperative if I see other fishers are joining.	Taylor and Todd (1995); Venkatesh and Brown (2001); Ajzen (1991); Field Study
SIPI2		I will engage with the cooperative activities if most people who are important to me think in the same way.	
SIPI3		I will sell my crabs through the cooperative if most people who are important to me think in the same way.	
SIPI4		With regard to joining the cooperative, I want to do what other fishers do.	
SIFI1		I will sell crabs through the cooperative if my family members wish me to do so.	Taylor and Todd (1995); Venkatesh and Brown (2001); Beedell and Rehman (1999); Ajzen (1991)
SIFI2		With regard to joining the cooperative, I want to do what my family members expect me to do.	
SIFI3		I will join in the cooperative	

		if my family members think that I should.	

5.3.2.2 Questionnaire – Section 2

The objective of this section was to identify and measure the items with respect to the antecedents of situational factors that might influence the adoption of a cooperative, the intention to be engaged with a cooperative and the perceived sustainable livelihood of the crab fishers.

The construct 'situational factors' reflects external variables as perceived behavioural control variables with government support and NGOs' support measured to explain the influence of this construct on the individual crab fisher's decision making towards the adoption of a fishers' cooperative. For government support, scale items from SFGS1 to SFGS7 were measured with all these items derived from the past literature (El-Gohary, 2012; Quaddus & Hofmeyer, 2007; Goldsmith, 2011). For NGOs' support, the scale items from NGOs1 to NGOs 7 were derived from the group interview in the field study and finalised as per the study's requirement.

The construct 'intention to be engaged with a fishers' cooperative' reflects the actual behaviour of the crab fishers and the crab suppliers backed by their attitudes towards the adoption of innovation (i.e. a cooperative) in the existing mud crab value chain. It was measured by the scale items from INC1 to INC5 which were derived from past studies (Taylor & Todd, 1995; Zolait, 2010; Ajzen, 1991; Nasri, 2011). In the field study, all the scale items for intention were cross-checked to match the findings and then compared with the field study findings to be contextualised for this study.

The construct 'perceived sustainable livelihood of crab fishers' reflects the perceived outcome from the perceived intention of the existing channel members towards a fishers' cooperative. It was measured through five scale items from PSL1 to PSL5 (Kim et al., 2013; Tang et al., 2013; Ahmed et al., 2010). In the field study, all the scale items for intention were cross-checked to match the findings and then compared with the field study findings to be contextualised for this study. Table 5.3 below lists the items for situational factors and social influence and their corresponding literature source.

Table 5.3: Measurement items and related statements of SF, INC and PSL

Situational Factors(SF)	Dimension	Statements	Sources
SFGS1	Government Support	- taking initiative to form the fishers' cooperative	El-Gohary (2012); Quaddus and Hofmeyer (2007); Goldsmith (2011); Field Study
SFGS2		- enacting the operating rules for the cooperative	
SFGS3		- managing the operations of the cooperative	
SFGS4		- infrastructure for the establishment of the cooperative	
SFGS5		- initial capital for the cooperative	
SFGS6		- organizing required training	
SFGS7		- motivating crab fishers to join the cooperative	
SFNS1	NGOs' Support	- taking initiative to form the fishers' cooperative	Field study
SFNS2		- enacting the operating rules for the cooperative	
SFNS3		- managing the operations of the cooperative	
SFNS4		- infrastructure for the establishment of the cooperative	
SFNS5		- initial capital for the cooperative	
SFNS6		- organizing required training	
SFNS7		- motivating crab fishers to join the cooperative	
Intention to be engaged with a cooperative (INC)			
INC1		I intend to participate in the cooperative.	Taylor and Todd (1995); Zolait (2010); Ajzen (1991); Nasri (2011); Field Study
INC2		I am willing to be engaged with the cooperative for the crab business.	
INC3		I will sell crabs through the cooperative.	
INC4		I am likely to be involved with the cooperative to achieve my professional objectives.	
INC5		I intend to use the cooperative rather than the traditional system of crab selling.	
INC6		I will recommend others to be involved with the cooperative.	

INC7		I will encourage my peers to sell their crabs through the cooperative.	
Perceived Sustainable Livelihood (PSL)			
PSL1		My livelihood will be enhanced if I become engaged with the cooperative.	Kim et al. (2013); Tang et al. (2013); Ahmed et al. (2010).
PSL2		My social well-being will be ensured by engaging with the cooperative.	
PSL3		Engaging with the cooperative will enable us to conserve our natural resources (such as raw crab).	
PSL4		Engaging with the cooperative will enable us to reduce our vulnerability.	
PSL5		My livelihood will be ensured if I adopt the cooperative and sell crabs through it.	

5.3.2.3 Questionnaire Section – 3: Demographic variables

Demographic variables were measured by different types of scales using both open-ended and closed-ended questions. The demographic details included the gender, age, yearly income, education, main source of income and duration of involvement. In addition, details were sought on the level of involvement with crab fishing/fishing-related activities, assets used for this job, parent's occupation, and location of each crab fisher and crab supplier. Table 5.4 presents the demographic items used in this study.

All participants were male. The average age group for the crab fishers was approximately 45 years but for the crab suppliers, this was substantially different. Among the 10 questions in the demographic section, seven questions (Q1, Q4, Q6 to Q10) used nominal scales; the other three (Q2, Q3, and Q5) used numeric values that represented a measure. The age, income and education of the respondents especially showed the differences between the crab fishers and crab suppliers.

Table 5.4: Demographic variables

Items	Variable	Measure
Q1	Gender	(i) Male (ii) Female
Q2	Age	(i) 18–24 (ii) 25–34 (iii) 35–44 (iv) 45–54 (v) > 55 years
Q3	Income	Monthly income in Bangladesh taka
Q4	Education	(i) Nil (ii) Primary (iii) Below Secondary (iv) Secondary (v) Others
Q5	Duration of being involved in crab fishing/business	In years/months
Q6	Main source of income from crab fishing	(i) Yes (ii) No
Q7	Level of involvement	i) Crab.....% (ii) other .....%
Q8	Assets used for crab fishing/ business	(i) Fishing boats; (ii) Fishing nets; (iii) Fishing gear
Q9	Parent's occupation	(i) Crab fishing; (ii) Crab supplier; (iii) Others
Q10	Location/District	

5.3.3 Pre-Testing Procedure

The initial version of the questionnaire was pre-tested among a small group of sample respondents selected through network acquaintances (Colgate et al., 2007) in one of the coastal villages of the Chittagong district. The key purpose of the pre-testing was to ensure that the question items were easily understandable to the respondents. For easy understanding, the questionnaire developed in English was then translated into the Bangla language. The questionnaire was also verified by an expert for the appropriateness of the translated questionnaire (Andaleeb, 2001). A total of 11 respondents: eight crab fishers and three others participated in the pre-testing with these responses not included in the final analysis. This procedure of pre-testing helped to determine whether the survey instrument needed to be revised in terms of appropriate content, layout, wording, ability to be understood, and the speed of completion. Based on the opinion of the pre-testing respondents, some words relating to the social business concept in the questionnaire needed further clarification for better understanding. All the respondents' comments and suggestions were incorporated into the final design of the questionnaire.

5.3.4 Data Collection Method

The detail of the quantitative data collection has been discussed in Chapter 3. Yet a brief account of the data collection process is outlined here again in order to bridge with the data analysis under Chapter 6.

After the pre-test of the questionnaire, data were collected from a total of 185 crab fishers and 89 crab suppliers using separate instruments through face-to-face survey during February-March 2015. The sample respondents were selected from the Chittagong and Cox's Bazar district of the south-eastern part of Bangladesh. Quota sampling technique was used in this case to represent both the crab fisher and crab supplier population. Notably, the nature of the crab fishers is similar in both the south-eastern (Chittagong division) and south-western (Khulna division) parts of Bangladesh. Hence selecting the sample respondents from the one part of the country is perceived to be acceptable. The fishers and suppliers were approached through location intercept technique. Given that the fishers are largely less educated, location intercept technique was deemed appropriate as they were approached while they gathered in local huts and/or the bazaar either to sell their catches or in their leisure time. The collected data were entered into SPSS spreadsheet immediately; and the details of the data entry process have been discussed in Chapter 3.

5.4 SUMMARY

In this chapter, guided by the final revised research model (see Figure 4.7), all the hypotheses developed for the study were presented. The rationale of the hypotheses was also explained illustrating their alignment with past studies and the field study findings. In total, 14 direct hypotheses and five mediating hypotheses were developed to describe the relationships between the variables, as proposed in the final research model (see Figure 4.7). Finally, the chapter described the measurement items for the survey questionnaire. The measurement items were selected based on both the literature and the field study outcomes. Furthermore, the chapter covered the pre-testing procedure undertaken before the final survey to fine-tune the survey instrument. The final questionnaire was then used to administer the survey, with this discussed in the next chapter (Chapter 6).

CHAPTER 6

DATA ANALYSIS

6.0 INTRODUCTION

The quantitative data analysis procedures and the results derived from the analysis are presented in this chapter. The partial least squares (PLS)-based structural equation modelling (SEM) by applying Smart PLS3 has been used to present the quantitative data analysis. Furthermore, this chapter includes details of the psychometric properties of the constructs used in the measurement model. Factor loadings, *t*-statistics, composite reliability (CR) and average variance extracted (AVE) were used as proof of the reliability and validity of the reflective constructs. The relative importance of the formative items towards the formation of the related latent construct was assessed to examine the formative constructs. After assessing the measurement model, the structural model was assessed. Estimates of path coefficients, *t*-statistics and R^2 values are presented to determine the degrees and magnitudes of the effects of exogenous variables and the explanatory power of the model. The chapter concludes by describing the results of the hypotheses, which were developed in Chapter 5.

6.1 DATA EXAMINATION

6.1.1 Data Cleaning and Treatment of Missing Values and Outliers

For the quantitative data analysis, a total of 274 survey responses were collected from the major mud crab value chain members, namely, crab fishers and crab suppliers. In all, 302 respondents were approached to participate in the study. Although 296 of them agreed to participate, 22 responses were found to be incomplete. Hence, 274 responses were found to be useful for data analysis. Of the 274 respondents, 185 (67.5%) were crab fishers and 89 (32.5%) were crab suppliers. As suggested by Neuman (2000), all questionnaires were checked for inappropriate responses or incompleteness and to determine the usability of the data. While screening the raw data, two missing values were identified. As the missing values were not high in number, they were replaced by the estimated means method (Roth

& Switzer, 1995). The data set was then further examined to trace whether any outliers were present.

6.1.2 Selection of Estimation Method

As mentioned before, the current study used structural equation modelling (SEM) for estimation due to its ability to represent unobservable latent constructs estimating relationships with its observed variables (indicators), the measurement errors for the observed variables, and the use of these variables in a hierarchical multidimensional construct. Two separate approaches are used in SEM: i) covariance-based SEM that is run through software, such as LISREL, AMOS and EQS; and ii) correlation-based SEM that is run based on PLS Graph, Smart-PLS, etc. The software should be selected based on the objective and conceptual model of the study. The researcher chose SMART PLS3 software to run the structural equation modelling (SEM). The description about SMART PLS and the justification for using this software are discussed below.

6.1.2.1 Partial least squares (PLS)-based SEM

Partial least squares-based SEM (PLS-SEM), a confirmatory second-generation multivariate analysis tool, was used in the study to test the hypotheses in the research model as opposed to the covariance-based (COV-SEM) approach (such as LISREL, EQS and AMOS). Partial least squares (PLS) was chosen owing to the predictive nature of the study, and its ability to model complex composite multidimensional constructs with many different dimensions and paths, to handle formative measures and, finally, to deal with a small to medium sample size (Chin, 1998b; Chin & Gopal, 1995; Barclay et al., 1995). A components-based SEM technique PLS is similar to regression; however, it simultaneously models the structural paths (i.e. the theoretical relationships between latent variables) and the measurement paths (i.e. the relationships between a latent variable and its indicators). Unlike COV-SEM, it tests the strength of individual component relationships to show the significance of individual paths, rather than the overall fit of a proposed model, for observed covariance amongst the variables (Johnston et al., 2004). Reasons for using PLS for data analysis include the ability to estimate formative measures, the ability to model composite higher-order constructs and the ability to build a complex framework of multi-block analyses for a hierarchical model (Wetzel et al., 2009; Rai et al., 2006).

Six second-order formative constructs are also in the study's model. Chin (1998b) noted that using LISREL/AMOS for formative indicators becomes problematic as it attempts to account for all the covariance between the measures. The reason is that the statistical algorithm assumes that the correlations between indicators for a specific latent variable are caused by that latent variable; therefore, all items in COV-SEM must be modelled as reflective. Although some authors have suggested the use of at least two paths emanating from a formative construct or to use at least two reflective measures to avoid identification problems (inability of the proposed model to generate unique estimates) of formative constructs when used in COV-SEM (Jarvis, et al., 2003; Mackenzie et al., 2005), the suggestion is still debatable.

Sample size adequacy: As mentioned before, a total of 274 survey responses were collected from the crab fishers and crab suppliers. As indicated in the literature, the size of the sample was considered satisfactory for running PLS-based SEM (Hair et al., 1998; Gefen et al., 2000; Barclay et al., 1995). The theoretical model was made of 25 constructs, of which 19 are first-order constructs and six are second-order constructs. All the first-order constructs are reflective in nature. Among the six second-order constructs, five are formative and one is reflective in nature. The theoretical model involved five endogenous latent variables to illustrate the structural relationships between the latent constructs. The endogenous latent variables of the study are perceived benefits, perceived barriers, attitude, intention and perceived sustainable livelihood of crab fishers. For the five endogenous variables, Gefen et al. (2000) mentioned that the sample size should be at least 50 ($5 \times 10 = 50$); as per Barclay et al. (1995) and Chin (1998b), it should be at least 30 ($3 \times 10 = 30$) in the model as the largest number of antecedent constructs leading to an endogenous construct as predictors in a regression was five. Therefore, the 274 responses of this study are adequate for data analysis using PLS-based SEM.

6.1.3 Examination of Possible Biases

Under the examination of possible biases, two tests were conducted: non-response bias test and common method bias test.

6.1.3.1 Non-response bias

Self-reported responses in any survey may encounter the problem of non-response bias which may limit the representativeness of the survey data. Non-response bias refers to differences in the answers of non-respondents and respondents (Lambert & Harrington, 1990). It is often considered a problem in survey research (Lambert & Harrington, 1990). Respondents who participated in the survey may have somewhat different characteristics to those who did not: thus, there is always the potential for non-response bias. The sample data should represent the population and, therefore, the data from the first wave of respondents and from the last wave of respondents should be similar. Although different strategies, such as communicating with the potential respondents in person, etc., were followed to obtain a higher response rate and to minimize non-response bias (Lambert & Harrington, 1990), non-response bias was tested by comparing two waves of data through a paired sample *t*-test (Armstrong & Overton, 1977). The test results are shown in Table 6.1 for crab fishers and crab suppliers, accordingly. Of 184 responses from the crab fishers, the first 50 responses were considered as the first wave and the last 50 responses were treated as the last wave. The same applied for the crab suppliers, with the first 44 respondents treated as the first wave and the last 44 respondents as the last wave. A paired sample *t*-test was run to find whether any differences of opinion existed between the two waves of data. The *t*-statistics showed that the responses of the first-wave respondents necessarily conformed to be 'not significantly different' from the responses of the second or last wave of respondents ($p > 0.05$) for all the crab fishers and for the supplier constructs used in the study. Hence, non-response bias is absent from the data set.

Table 6.1: Non-response bias test for crab fishers and crab suppliers through paired sample *t*-test

Sl no.	Particulars	Mean Difference Wave 1 & Wave 2		Std. Deviation		*p*-value	
		Fishers	Suppliers	Fishers	Suppliers	Fishers	Suppliers
1	IFS	-0.098	0.281	0.933	0.798	0.457	0.061
2	IFE	0.157	0.250	1.020	0.866	0.278	0.062

3	IFI	-0.088	0.267	0.955	0.858	0.512	0.592
4	CFSI	-0.244	-0.266	1.209	0.791	.156	0.645
5	CFHC	-0.268	0.106	1.806	2.008	0.294	0.728
6	CFVC	0.325	-0.509	1.482	1.264	0.124	0.711
7	ATC	0.141	-0.009	1.120	1.060	0.372	0.955
8	PBCMI	0.020	0.219	0.906	1.558	0.878	0.355
9	PBCAI	0.000	-0.051	0.915	0.824	1.000	0.683
10	PBCC	-0.007	0.121	1.753	1.423	0.979	0.575
11	PBDL	-0.407	-0.562	2.379	2.09	0.228	0.082
12	PBLT	0.410	-0.145	1.571	1.118	0.225	0.421
13	PBLU	0.256	-0.172	1.198	1.419	0.239	0.426
14	SIPI	0.029	0.045	1.129	1.230	0.853	0.808
15	SIFI	-0.092	-0.356	1.468	1.472	0.658	0.116
16	SFGS	0.050	0.204	0.833	0.814	0.668	0.103
17	SFNS	0.154	0.314	1.124	1.124	0.333	0.070
18	INC	0.154	0.123	0.836	0.773	0.194	0.295
19	PSL	-0.137	0.077	0.903	0.585	0.283	0.386

6.1.3.2 Common method bias

Another limitation of survey research is the prevalence of common method bias in the data which is a potential threat to the validity of the results. As survey research employs self-reporting measures, it may suffer from the possibility of being susceptible to common method bias or variance (Podsakoff et al., 2003). Common method bias arises when both dependent and independent variable data are collected from a single informant (Podsakoff & Organ, 1986). Several procedural (ex-ante: prior data collection) and statistical (ex-post: after data collection) initiatives were taken to reduce the effects of common method bias in this research. Under the procedural steps, at first, data were collected carefully from the respondents through face-to-face interviews. The respondents were communicated with in person and were informed about the study in detail: in addition, the cover letter of the questionnaire assured respondents of their anonymity and requested their honest responses. In addition, a reverse-coded scale item technique was used in the

questionnaire. This was aimed at reducing respondents' evaluation apprehension and, thereby, helped to control possible sources of common method bias (Podsakoff et al., 2003). These procedural steps, as recommended by Sharma (2011), helped to minimize common method bias in this study.

Under the statistical steps, the researcher ran Harman's single factor test to examine the prevalence of common method bias in the data (Podsakoff & Organ, 1986; Podsakoff et al., 2003). This test assumes that if common variance is present, one general factor would account for the majority of covariance in the variables used (Podsakoff et al., 2003). Principal component factor analysis revealed that the measurement items used in the study generated a total of 21 different factors. The presence of several distinct factors and a relatively low variance (19.66%) explained by the first factor, with the total variance explained by these 21 different factors being 76.89% for the crab fishers. For the crab suppliers, the variance explained by the first factor was also low (16.90%), with the total variance explained by the 22 different factors being 81.89%. These results prove that the data set was not susceptible to common method bias (Podsakoff & Organ, 1986; Podsakoff et al., 2003). The total variance explained by the factors derived from the factor analysis is shown in Table 6.2(a) and Table 6.2(b).

Table 6.2(a): Total variance explained for crab fishers

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	18.88	19.66	19.66	18.88	19.66	19.66
2	7.62	7.94	27.61	7.62	7.94	27.61
3	7.28	7.59	35.20	7.28	7.59	35.20
4	6.54	6.81	42.01	6.54	6.81	42.01
5	4.72	4.92	46.94	4.72	4.92	46.94
6	3.83	3.99	50.94	3.83	3.99	50.94
7	3.25	3.40	54.33	3.25	3.39	54.33
8	2.52	2.63	56.96	2.52	2.62	56.96
9	2.27	2.37	59.33	2.27	2.37	59.33

10	1.95	2.04	61.37	1.95	2.03	61.37
11	1.71	1.79	63.16	1.71	1.79	63.16
12	1.66	1.73	64.89	1.66	1.73	64.89
13	1.59	1.66	66.55	1.59	1.65	66.55
14	1.52	1.58	68.13	1.52	1.58	68.13
15	1.35	1.41	69.54	1.35	1.41	69.54
16	1.31	1.37	70.91	1.31	1.37	70.91
17	1.24	1.29	72.21	1.24	1.29	72.21
18	1.20	1.25	73.46	1.20	1.25	73.46
19	1.14	1.20	74.65	1.14	1.19	74.65
20	1.09	1.14	75.78	1.09	1.13	75.78
21	1.06	1.11	76.89	1.06	1.10	76.89
Extraction method: principal component analysis						

Table 6.2(b): Total variance explained for crab suppliers

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.22	16.90	16.90	16.22	16.90	16.90
2	10.99	11.45	28.35	10.99	11.45	28.35
3	7.44	7.75	36.11	7.44	7.75	36.11
4	6.37	6.64	42.75	6.37	6.64	42.75
5	4.75	4.95	47.70	4.75	4.95	47.70
6	3.61	3.76	51.47	3.61	3.76	51.47
7	3.25	3.38	54.86	3.25	3.38	54.86
8	2.81	2.93	57.79	2.81	2.93	57.79
9	2.78	2.89	60.68	2.78	2.89	60.68
10	2.45	2.55	63.24	2.45	2.55	63.24
11	2.04	2.13	65.37	2.04	2.13	65.37
12	1.89	1.97	67.34	1.89	1.97	67.34
13	1.77	1.84	69.19	1.77	1.84	69.19
14	1.65	1.72	70.91	1.65	1.72	70.91

15	1.61	1.67	72.59	1.61	1.67	72.59
16	1.49	1.55	74.14	1.49	1.55	74.14
17	1.44	1.50	75.65	1.44	1.50	75.65
18	1.32	1.37	77.03	1.32	1.37	77.03
19	1.25	1.30	78.34	1.25	1.30	78.34
20	1.20	1.25	79.59	1.20	1.25	79.59
21	1.10	1.15	80.74	1.10	1.15	80.74
22	1.09	1.14	81.89	1.09	1.14	81.89
Extraction method: principal component analysis.						

6.1.4 Sample Profile

In the current study, the sample respondents were the major members of the coastal mud crab value chain of Bangladesh. The main method for selecting the crab fishers and crab suppliers as respondents was through the snowball sampling technique, with these members chosen to represent the mud crab value chain business of Bangladesh and the logical generalization that has been derived from the outcomes (see Table 6.3).

Table 6.3: Sample profile of the survey respondents

Particulars	Crab Fishers	Crab Suppliers
Total Respondents	185	89
Gender	Male = 100% Female = Nil	Male = 100% Female = Nil
Age	Mean = 35.91 years (SD = 10.15)	Mean = 36.60 years (SD = 8.42)
Income (monthly)	Mean = BDT 11,716.21 (SD = 6799.07)	Mean = BDT 19,393.25 (SD = 13768.88)
Duration in crab business	Mean = 12.34 years (SD =8.38)	Mean = 11.40 years (SD = 6.08)

Note: SD = standard deviation; BDT = Bangladesh taka

At the time of the data collection, all crab fisher and crab supplier respondents were male, although some females were crab fishers; however, they were not present at the time of the survey due to social barriers, such as male dominance. Various age groups were engaged with crab catching in the data

collection area. The surveyed crab fishers had a mean age of 35.91 years, with a standard deviation of 10.15 years. Most crab suppliers in the survey were middle-aged with a mean age of 36.60 years and a standard deviation of 8.42 years. The crab business and crab catching were mentioned as the main income source by the crab suppliers and fishers, respectively, although some fishers had other sources of income for their livelihood due to seasonality factors and the lack of crab catching in their respective area. All the crab fisher respondents inherited this fishing profession from their parents. Data show that the crab fishers' mean monthly income was BDT 11,716.21 and the standard deviation was BDT 6,799.07. However, the crab suppliers, as the real businessmen in the crab business, were well off. They lived nearby or in the same village as the crab fishers. The crab suppliers' mean monthly income of BDT 19,393.25 and standard deviation of BDT 13,768.88 were much higher than the crab fishers' income.

The high standard deviations in monthly income reflect high variations in the income of both crab fishers and crab suppliers. Crab fishers have more involvement and experience with the crab business, and their engagement with this profession showed a mean duration of 12.34 years with a standard deviation of 8.38 years. The crab suppliers' data show that they were engaged with the business with a mean time of 11.40 years with a standard deviation of 6.08 years, with this presented in Table 6.3.

6.2 MODEL ASSESSMENT

6.2.1 Justification of Reflective and Formative Measures

In this section, justifications in support of the appropriateness of the reflective and formative constructs used in the model are discussed. Although it is challenging to anticipate the nature of an indicator, that is, whether it is reflective or formative, the researcher primarily judged the nature of a latent variable by concentrating on the theoretical aspect and the definitions of relevant constructs and then relating them to the concept of reflective and formative indicators. The modelling of reflective or formative constructs requires theoretical justification (Diamantopoulos & Siguaw, 2006; Coltman et al., 2008). Hence, the researcher considered individual factors, channel factors, perceived benefits, perceived barriers and situational factors as

formative constructs and social influence as a reflective construct based on the definition and underlying literature support for these constructs. For example, *individual factors* were measured as a second-order formative construct consisting of three components: *skill*, *experience* and *involvement*. Each of these three components had its own first-order reflective items. In turn, these three components, *skill*, *experience* and *involvement* formed the combined *individual factors*. The three components or sub-constructs were not correlated to each other and they measured different underlying dimensions of the latent variable (Chin, 1998b); hence, operationalizing *individual factors* as a second-order formative construct was justified. Again, *skill* (IFS), *experience* (IFE) and *involvement* (IFI) were measured by five, three and four items, respectively, with these being highly correlated; hence, they were measured as a reflective construct (Bollen, 1989). *Channel factors* were operationalized as a second-order formative construct consisting of three components: *supplier influence*, *horizontal competition* and *vertical conflict*. Each of these sub-constructs was measured as reflective in the first order. Previous researchers have measured this construct as formative (Kim, 2000; Frazier & Rody, 1991); the measuring sub-constructs, *supplier influence* (CFSI), *horizontal competition* (CFHC) and *vertical conflict* (CFVC), were treated as reflective due to the correlation between the scale items.

The *perceived benefits* of a cooperative were measured as a second-order formative construct using PBCMI, PBCAI and PBCC as the key sub-constructs. These three sub-constructs by definition are completely distinct from each other. The measuring items of each sub-construct are highly interchangeable, reflect one another and are treated as reflective. Similarly, *perceived barriers* to a cooperative were measured by *dishonesty of leaders* (PBDL), *lack of trust* (PBLT) and *lack of unity* (PBLU), which showed differences between these concepts and thus was treated as formative. To measure the three sub-constructs, the items for each of their variables were reflective in nature (PBDL [4 items], PDLT [5 items] and PBLU [7 items]). *Social influence* as a social norm was measured by *family influence* and *peer influence*, which were treated as reflective both in the first order and in the second order, following previous researchers (Kulviwat et al., 2009).

Situational factors were measured by *government support* and *NGO support* which were different in nature and treated as second-order formative constructs; however, the measuring items of each sub-construct were treated as reflective, following previous researchers (Igbaria et al., 1997). In the current study, 19 first-order constructs, IFS, IFE, IFI, CFSI, CFHC, CFVC, PBCMI, PBCAI, PBCC, PBDL, PDLT, PBLU, SIFI, SIPI, SFGS, SFNS, ATC, INC and PSL (see Section 6.2.3 for each construct's full term), were treated as reflective constructs due to the nature of their item scales. The justifications of other formative constructs are described under each construct's definition, and apply where the items are not correlated and measure different underlying dimensions of the latent variable (Chin, 1998b). Jarvis et al. (2003) mentioned that a variable can be modelled as formative when the following decision rules are met: (a) the direction of causality is from indicators to constructs; (b) the indicators need not be interchangeable; and (c) covariation among indicators is not necessary.

6.2.2 Steps of Model Assessment

Data analysis in PLS involves two essential steps: (i) assessment of the measurement model describing the relationships between the latent constructs and their manifest indicators; and (ii) assessment of the structural or inner model describing the hypothesized relationships between the latent constructs (Quaddus & Hofmeyer, 2007; Santosa et al., 2005). A re-sampling technique in PLS, in this case, bootstrapping (Efron & Tibshirani,1993), was used for the analysis and assessment of the structural model as it has been found to be more efficient (Chin et al., 2003). Although no consensus exists regarding the size of a bootstrap sample, the minimum recommended number for a sub-sample is 200 (Chin, 2001); the current research considered a sub-sample of 1000 in the bootstrapping process. The sequential assessment for the models is shown in Table 6.4.

Table 6.4: Steps of model assessment

Stage	Analysis	Analysis	Constructs
1	Assessment of the measurement model	Item reliability	Reflective
		Internal consistency	Reflective
		Discriminant validity	Reflective

		Absolute importance of the items Multicollinearity of the test	Formative Formative
2	Assessment of the structural model	Amount of variance explained (R^2) Path coefficient (β) Statistical significance of *t*-values	Both Both Both

6.2.3 Assessment of the Measurement Model

Measurement of the strength of the psychometric properties of the constructs in the model commenced by assessing their reliability and validity using PLS-based SEM (PLS-SEM). As previously mentioned, the model for this study consisted of 19 first-order constructs and six second-order constructs. Both first-order and second-order constructs contained reflective as well as formative items or indicators. Individual factors (IF), channel factors (CF), perceived benefits of a cooperative (PBC), perceived barriers to a cooperative (PB) and situational factors (SF) were the second-order formative constructs and social influence (SI) was the second-order reflective construct. Among the 19 first-order reflective constructs, skill (IFS), experience (IFE) and involvement (i.e. participation in the existing system process) (IFI) have been used as sub-constructs to measure the construct individual factors (IF); supplier influences (CFSI); horizontal competition (CFHC); and vertical conflict (CFVC) have been used as sub-constructs to measure the construct channel factors (CF); more income (PBCMI), alternative income (PBCAI) and compatibility (PBCC) have been used as sub-constructs to measure the construct perceived benefit of a cooperative (PBC); dishonesty of leaders of the cooperative (PBDL); lack of trust between channel members (PBLT) and lack of unity among channel members (PBLU) have been used as sub-constructs to measure the construct perceived barriers to a cooperative (PB); government factors (SFGS) and NGO factors (SFNS) have been used as sub-constructs to measure the construct situational factors (SF); and peer influence (SIPI) and family influence (SIFI) have been used as sub-constructs to measure the construct social influence (SI). Attitude to a cooperative (ATC) is measured as a reflective construct consisting of five items and was examined as the outcome variable of the relational influence of the followings six constructs IF, CF, PBC, PB, SI and SF. The intention to be engaged with a cooperative (INC) is also a reflective construct and is presented as the outcome of the influence of three

constructs ATC, SI and SF. Finally, perceived sustainable livelihood (PSL) was modelled as a reflective construct and was considered as the outcome of ATC and INC of the crab fishers and crab suppliers in the measurement model. The descriptive statistics of the items for both the crab fishers and crab suppliers are shown in Table 6.5 in Appendix 6.1.

As shown in Table 6.5, the average value for each item for the crab fishers was more than the midpoint 3 in the 6-point Likert scale with standard deviations ranging from 0.46 to 3.12. For the crab suppliers, the average value for most items was more than the midpoint 3 except for the following seven items, CFSI6, CFSI7, CFVC3, PBLT2, PBLT4, PBLT5 and PBLU6 which all had values below the midpoint 3 and, for most items, standard deviations ranging from 0.46 to 3.04. The next section outlines the discussion on different aspects of reliability and validity and on the relevant assessments of the constructs used in the study.

6.2.3.1. Assessing first-order reflective constructs

The strength of the psychometric properties of the reflective items was assessed by examining convergent validity and discriminant validity. As reflective items are measuring the same phenomenon, they should be unidimensional with positive correlations between the measures (Bollen & Lennox, 1991). The 19 first-order reflective constructs in the final model are reflective in nature and are presented in Figure 6.1, the initial model showing the relationships between the constructs. The reliability and validity of these 19 first-order constructs are discussed below.

Item reliability: Item reliability refers to an analysis that estimates the amount of variance in each individual item's measure that is due to the construct (Barclay et al., 1995). It provides assurance that the items used to measure a construct are dependable and involve less error. Although high item loadings indicate high reliability of the measures, the past literature is inconsistent about the cut-off point of the item loading. Igbaria et al. (1995) deemed 0.4 as an acceptable minimum loading. Hair et al. (1998) suggested that loadings above 0.3 were significant, above 0.4 were more significant and above 0.5 were very significant. Chin (1998a) believed that item loadings should be above 0.5. Carmines and Zeller (1979) maintained 0.7 as the reliability limit whilst Barclay et al. (1995) specified 0.70 as the minimum limit (Hair et al., 2011; Barclay et

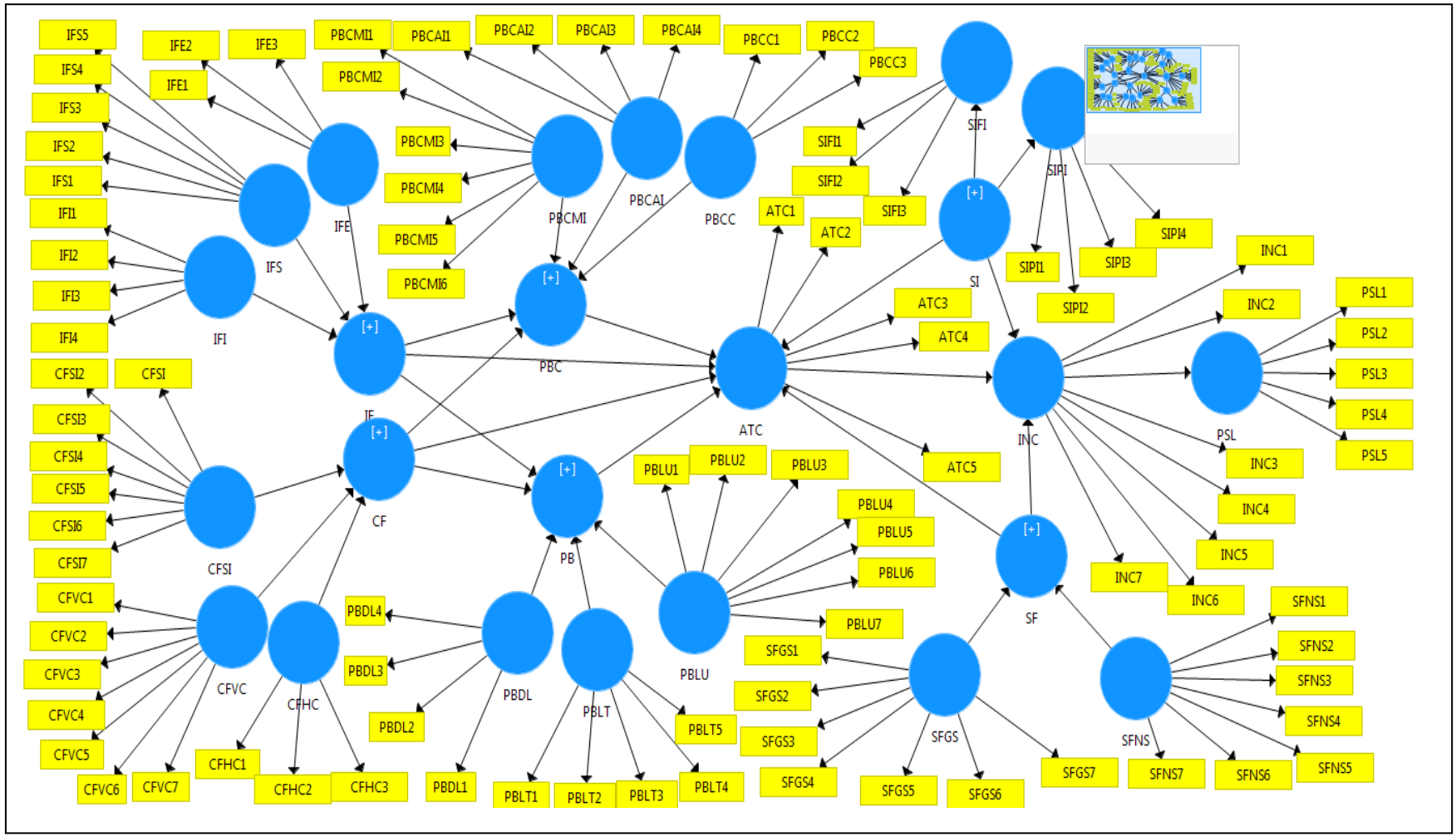
al., 1995; Henseler et al., 2009). However, Nunnally (1994) argued that, in the case of strong theoretical support, further reviews of the low loading items were warranted. This would be especially pertinent if the low loading items added to the explanatory power of the model. Taking into consideration the recommendations of the extant literature and the need to maximize the measurement model's ability to fulfil the convergent validity requirements, a minimum value of 0.45 was determined for factor loading. Table 6.6 (in Appendix 6.2) and Table 6.7 (in Appendix 6.3) show the item loadings and the corresponding *t*-values of all the items for crab fishers and crab suppliers, respectively. Furthermore, Tables 6.6 and 6.7 show the Cronbach's alpha (α) and composite reliability (CR) values of the respective constructs, all of which fall within the acceptable limit. The model was revised based on an iterative procedure through which all non-significant items (identified through SmartPLS3) were eliminated from the model. This step was necessary to derive a more parsimonious model. The reason is that, to achieve high internal consistency, researchers need to eliminate indicators that are only weakly correlated with other items of the same construct (Churchill, 1979). However, formative scales can model different independent dimensions within one scale (Ellwart & Konradt, 2011).

The measurement model for the crab fishers is shown in Table 6.6 in Appendix 6.2 which reveals that 14 items (CFSI1, CFSI2, CFSI3, CFSI4, CFHC3, PBCC2, PBLU6, PBLT1, SFGS3, SFGS4, SFNS1, SFNS2, SFNS3 and SFNS4) had low loadings (less than 0.45). Hence, these items were considered for deletion during the several runs of of SmartPLS3 following the recommendation of Hair et al. (2011) and Barclay et al. (1995). After deletion of these items, the required output for item reliability was achieved. The measurement model for the suppliers' data is shown in Table 6.7 in Appendix 6.3, and shows that 19 items were deleted (CFSI1, CFSI2, CFSI3, CFSI4, CFHC1, CFVC3, CFVC7, PBCC1, PBCMI6, PBCC2, PBLT3, PBLU6, SFGS3, SFGS4, SFNS1, SFNS2, SFNS3, SFNS4 and SFNS5) with few remaining items having low loadings (less than 0.45) and a few items with higher loadings (loadings between 0.40 and 0.70) to increase internal consistency above the suggested threshold value (Hair et al., 2011).

Internal consistency: The internal consistency of the items was measured with the reliability. Reliability is the extent to which the scale items produce

consistent results if repeated measurements are made on the constructs (Malhotra, 2004). The reliability analysis is used to minimize errors in measuring the constructs of interest (Nunnally & Bernstein, 1994). Reliability is concerned with the consistency of scale performance (Cooper & Schindler, 1998; Zikmund, 2003). Reliability is usually measured through Cronbach's (1951) alpha coefficient (Nunnally, 1978; Sekaran, 2000) which estimates the degree to which the items in the scale are representative of the domain of the construct being measured. Cronbach's alpha is regarded as the first measure that a researcher should use to assess the reliability of a measurement scale (Nunnally, 1978; Churchill, 1979), especially in measuring multi-point scale items (i.e. the 6-point Likert scale used in this study) (Sekaran, 2000). In the current study, the internal consistency of the items was also investigated by Cronbach's alpha: for internal consistency to be acceptable, these values should exceed the minimum of 0.7 (Nunnally, 1978). However, Cronbach's alpha is known to be non-robust with its key limitation being that all items are assumed to contribute equally to reliability. Composite reliability (CR) is a more robust measure of reliability which is calculated based on the standardized loading and measurement error for each item (Shook et al., 2004). As suggested by Fornell and Larcker (1981), a composite reliability (CR) of 0.70 is generally regarded as acceptable. In the current study, composite reliability (CR) and Cronbach's alpha have been investigated to justify the item reliability and internal consistency of the items. In Tables 6.6 and 6.7 shown in Appendices 6.2 and 6.3, the composite reliability (CR) and Cronbach's alpha (α) values are shown for the first-order reflective constructs after deleting the low-loading items from the measurement model for both the crab fishers and crab suppliers, respectively.

Figure 6.1: Initial model showing the relationship between the constructs



Validity of the reflective constructs: Validity refers to the ability of the scale items to measure what they are intended to measure (Zikmund, 2003). One of the most important aspects of a valid construct is its construct validity (Nunnally & Bernstein, 1994). Construct validity is concerned with whether the scale items are measuring what they are meant to measure (Churchill, 1995). It ensures the development and/or deployment of correct and adequate operational measures for the concept being tested (Malhotra et al., 1996). Construct validity is examined in two ways: by ensuring convergent validity and discriminant validity. The next section discusses the convergent validity and discriminant validity of the reflective constructs.

Convergent validity: Convergent validity examines whether the scale items of a construct are highly correlated (Sekaran, 2000). The assessment of convergent validity is a fundamental part of assessing the measurement model. Convergent validity is ensured by checking the substantial factor loading of the items of the constructs (Hair et al., 1998; Raimondo et al., 2008) with a significant 0.01 level loaded onto the expected latent construct. Item loading measures the level of random error for each construct; hence, the lower the item loading, the higher the level of random error. This procedure could identify and eliminate the items in a specific construct that could increase the construct's level of random error (Fornell & Larcker, 1981). The loadings of each item used in the model are shown in Table 6.6 (for crab fishers) and Table 6.7 (for crab suppliers): Appendix 6.3 shows that the items are substantially and significantly loaded (> 0.5 at 0.01 level) onto the expected latent construct (Raimondo et al., 2008). Hence, the items are not only reliable but also converged to the relevant construct.

Discriminant validity: Discriminant validity ensures that scale items of a specific construct are not correlated too much with the items of another construct (Sekaran, 2000). It defines the degree to which any given construct is different from any other (Barclay et al., 1995). The square root of the AVE and the cross-loading matrix are widely used measures for discriminant validity (Igbaria et al., 1995; Barclay et al., 1995). According to Igbaria et al. (1995), the model is assessed as having acceptable discriminant validity if the square root of the AVE of a construct is larger than its correlation with other constructs (Hair et al., 2011).

Tables 6.8 and 6.9 present the value of the square root of AVE (shown in shaded diagonal numbers) and the correlation scores of latent variables (off-diagonal elements) for the first-order reflective constructs for crab fishers and suppliers, respectively. Both tables indicate that the square root of AVE is greater than the off-diagonal elements across the rows and down the columns for all the constructs. The AVE values are not relevant for the second-order formative constructs IF, CF, PBC, PB and SF. As shown in Tables 6.8 and 6.9, all first-order reflective constructs satisfactorily met this criterion for convergent validity. On the one hand, the constructs possess discriminant validity if the loading of items within a construct (shown in the columns in a cross-loading matrix) are greater than the loading of any other item within the same column (Barclay et al., 1995). On the other hand, the cross-loading matrices for both crab fishers and suppliers are shown in Tables 6.10 and 6.11, respectively, in Appendices 6.4 and 6.5. Both approaches for assessing discriminant validity are important to adequately prove discriminant validity at the construct level as well as at the item level. The correlation matrixes in Tables 6.8 and 6.9 show that the constructs used in the current study satisfy the requirements for discriminant validity as the square root of AVE is greater than the correlation values between the constructs.

Table 6.8: Inter-correlations for first-order reflective constructs of crab fishers' data

	ATC	CFHC	CFSI	CFVC	IFE	IFI	IFS	INC	PBCAI	PBCC	PBCMI	PBDL	PBLT	PBLU	PSL	SFGS	SFNS	SIFI	SIPI
ATC	0.836																		
CFHC	0.146	0.944																	
CFSI	-0.023	0.243	0.972																
CFVC	0.128	0.083	0.608	0.804															
IFE	0.054	0.154	0.197	0.101	0.925														
IFI	0.185	-0.063	0.037	0.167	0.621	0.904													
IFS	0.192	-0.054	-0.032	0.053	0.726	0.789	0.865												
INC	0.465	-0.089	-0.077	0.060	0.239	0.396	0.437	0.812											
PBCAI	0.616	0.259	0.061	0.219	0.222	0.341	0.339	0.491	0.802										
PBCC	0.281	-0.040	-0.076	0.197	0.133	0.260	0.213	0.231	0.393	0.757									
PBCMI	0.688	0.274	-0.012	0.178	0.199	0.301	0.303	0.521	0.734	0.329	0.845								
PBDL	0.109	0.576	0.228	0.116	0.083	-0.063	-0.016	-0.078	0.261	-0.123	0.290	0.952							
PBLT	0.063	-0.183	0.401	0.504	0.059	0.151	0.078	0.131	0.039	0.116	0.056	-0.109	0.730						
PBLU	0.256	0.005	0.178	0.429	0.031	0.199	0.137	0.263	0.272	0.285	0.339	0.125	0.437	0.770					
PSL	0.425	0.044	-0.005	0.181	0.202	0.324	0.314	0.624	0.546	0.261	0.530	0.119	0.061	0.285	0.847				
SFGS	0.434	0.011	0.091	0.215	0.104	0.239	0.233	0.502	0.461	0.201	0.454	0.165	0.119	0.221	0.530	0.762			
SFNS	0.355	-0.050	0.060	0.232	0.027	0.169	0.138	0.377	0.328	0.128	0.357	0.129	0.198	0.243	0.456	0.510	0.849		
SIFI	0.087	-0.076	-0.005	0.143	-0.135	-0.008	-0.037	0.141	0.119	0.214	0.081	0.045	0.043	0.315	0.268	0.234	0.299	0.944	
SIPI	0.128	-0.126	-0.071	0.068	-0.113	-0.004	0.021	0.161	0.174	0.191	0.183	0.027	-0.003	0.378	0.300	0.195	0.171	0.758	0.959

Note: Number on the diagonal is the square root of AVE of the respective construct.

Table 6.9: Inter-correlations of first-order reflective constructs for crab suppliers' data

	ATC	CFHC	CFSI	CFVC	IFE	IFI	IFS	INC	PBCAI	PBCC	PBCMI	PBDL	PBLT	PBLU	PSL	SFGS	SFNS	SIFI	SIPI
ATC	0.811																		
CFHC	-0.234	0.796																	
CFSI	0.271	-0.080	0.755																
CFVC	0.419	-0.193	0.709	0.815															
IFE	0.140	-0.009	-0.082	-0.066	0.893														
IFI	0.141	-0.116	-0.046	0.027	0.759	0.926													
IFS	0.137	-0.020	-0.138	-0.044	0.774	0.780	0.845												
INC	0.415	0.073	0.081	0.191	0.071	0.173	0.079	0.832											
PBCAI	0.662	-0.125	0.125	0.289	0.089	0.101	0.079	0.305	0.808										
PBCC	0.253	0.003	0.053	0.185	0.081	0.080	0.207	0.337	0.214	1.000									
PBCMI	0.718	-0.090	0.168	0.303	0.093	0.165	0.120	0.391	0.780	0.204	0.832								
PBDL	-0.049	0.363	0.357	0.356	0.009	-0.090	-0.086	-0.156	-0.087	-0.140	-0.038	0.958							
PBLT	0.147	-0.164	0.375	0.391	-0.071	0.001	-0.128	0.064	0.104	-0.265	0.128	0.273	0.767						
PBLU	0.412	0.013	0.550	0.605	0.059	0.058	0.020	0.224	0.291	0.101	0.354	0.448	0.523	0.892					
PSL	0.517	-0.206	0.149	0.244	0.120	0.114	0.058	0.487	0.420	0.102	0.473	-0.034	0.304	0.423	0.754				
SFGS	0.419	-0.200	0.152	0.242	0.166	0.172	0.047	0.277	0.301	0.053	0.382	0.145	0.111	0.213	0.265	0.763			
SFNS	0.181	-0.013	-0.088	0.044	0.059	0.113	0.095	0.147	0.123	0.031	0.107	0.015	0.141	-0.010	0.101	0.315	0.968		
SIFI	-0.029	0.169	0.232	0.068	0.035	0.080	-0.006	0.212	-0.082	-0.046	-0.059	-0.006	0.214	0.232	0.157	-0.022	-0.102	0.931	
SIPI	0.251	-0.049	0.367	0.260	-0.100	-0.031	-0.067	0.320	0.135	0.063	0.131	0.057	0.380	0.577	0.504	0.028	-0.153	0.492	0.937

Note: Number on the diagonal is the square root of AVE of the respective construct.

Discriminant validity at item level: Discriminant validity at item level was assessed by comparing the loadings and cross-loadings of the constructs. According to Hair et al. (2011), Barclay et al. (1995) and Henseler et al. (2009), the loading of items within a construct (shown in the columns) should be greater than the loading of any other item to prove discriminant validity among the constructs. Table 6.10 in Appendix 6.4 shows the cross-loading matrix for crab fishers. As expected, all the first-order reflective constructs of the crab fishers' model showed high correlation with their respective measurement items being also significantly higher than the items in the same column measuring other constructs. Based on the cross-loading matrix, five additional items, that is, ATC4, CFSI5, IFS3, SIPI1 and SIPI4, were then deleted from the crab fishers' data set due to their cross-loading.

For the suppliers' data in Table 6.11, as shown in Appendix 6.5, all the first-order reflective constructs also showed a high correlation (shaded), with their respective measurement items being significantly higher than the items in the same column measuring other constructs, except for a few items which show a lower value than the other items of the same column. Three items, namely, ATC4, IFS3 and SIPI1, were removed from the crab suppliers' data set due to cross-loading.

From the cross-loading matrix analysis for the crab fishers' and crab suppliers' data, it was evident that for the first-order reflective constructs, namely, reliability, internal consistency, discriminant validity (AVE > correlations) and convergent validity (loadings > 0.45; AVE > 0.50; CR > 0.70) for the data from both the crab fishers and crab suppliers were effectively done and satisfactorily fulfilled the requirements. Thus, the first-order measurement model was confirmed as reasonable for executing the second-order measurement model and the structural model in the following sections for the crab fishers and the crab suppliers.

6.2.3.2 Assessing second-order reflective constructs

In the current study, social influence (SI) was the only second-order reflective construct, and was measured by the items, family influence and peer influence. As stated earlier, reflective constructs were assessed through reliability, internal consistency (threshold > 0.70) and AVE (threshold > 0.50) (Hair et al., 2011). The construct social influence (SI) was a second-order construct as conceptualized by

past research studies (Kulviwat et al., 2009). That is why this was measured by the latent variable scores (construct scores) of family influence (SIFIc) and peer influence (SIPIc), which were as a result of the first-order constructs family influence and peer influence, as shown in Table 6.12 and Figure 6.2 below.

Table 6.12: Reliability, CR and AVE for second-order reflective construct SI

Second-order construct	First-order constructs	Crab Fishers				Crab Suppliers			
		Loading	***t*-value**	**CR**	**AVE**	**Loading**	***t*-value**	**CR**	**AVE**
Social influence (SI)	SIFIc	0.92	17.66	0.94	0.88	0.72	2.20	0.83	0.72
	SIPIc	0.95	23.03			0.96	4.60		

SIFIc = Latent variable score of family influence; SIPIc = Latent variable score of peer influence.

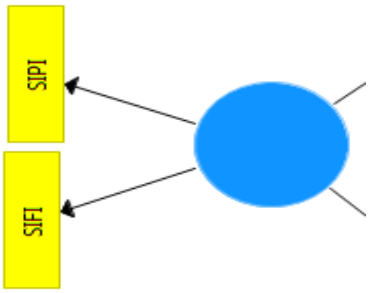


Figure 6.2: Second-order reflective construct of social influence (SI)

As shown in Table 6.12 above, social influence (SI), as a second-order reflective construct, is found to have fulfilled all the necessary criteria of convergent validity (score loading > 0.45; AVE > 0.50; CR > 0.70) and discriminant validity ([AVE > correlations] shown in Tables 6.10 and 6.11) for the crab fishers and crab suppliers' model.

6.2.3.3 Assessing formative constructs

The formative constructs were validated by composite measurement as formative items do not measure the same underlying dimension. Formative constructs are driven by their indicator items that are not strongly correlated and can be either negative or positive, are multidimensional and cause the construct to exist.

Therefore, internal consistency and reliability of the items are not important for a formative construct. Formative constructs are suitable for studying the cause and effect on other constructs by bringing diverse and disparate indicators into a holistic single construct (Barclay et al., 1995; Cenfetelli & Basselier, 2009; Coltman et al., 2008). The indicators' weights, which measure the relative importance of the formative items in the formation of the constructs, were used to make composite latent variables. The same principle was applied in the validation of the higher-order formative constructs. As formative indicators may represent different dimensions and are assumed not to be correlated, the use of loadings and AVE for formative indicators is misleading (Chin, 1998a). Studies have suggested using the weights of the formative indicators to provide information on their relative importance and the contribution of the indicators in forming the latent construct (Barclay et al., 1995; Cenfetelli & Basselier, 2009; Coltman et al., 2008). Therefore, the formative constructs for the current study were assessed by evaluating the significance of indicator weight and loading scores as well as by examining for multicollinearity among the formative indicators (Hair et al., 2011; Henseler et al., 2009). The following sub-sections explain the relevant details in this regard.

6.2.3.4 Validation of second-order formative constructs

The second-order construct may be defined as the latent variable created through the indicators and latent variables in a multiple-level hierarchy. Such constructs are hierarchically structured, multidimensional and involve more than one construct (Jarvis et al., 2003). The estimation of the higher-order latent constructs is a very useful method under structural modelling which allows for increased theoretical parsimony and reduced model complexity (Edwards, 2001; Law et al., 1998; MacKenzie et al., 2005). The measurement model and the structural model are thus specified for estimating the hierarchical component of the model and representing the loadings of the second-order latent variable on the first-order latent variables.

The study involved five constructs as higher-order formative constructs, namely, individual factors, channel factors, perceived benefits (of a cooperative), perceived barriers (to a cooperative) and situational factors. As in the first-order formative construct validation, the indicator weights were measured and the multicollinearity test was conducted to assess the validity of the second-order

formative constructs. In developing the higher-order construct, the researcher first constructed the first-order latent variables involving the reflective indicators. The second-order latent variable was then constructed using the linear composites of the items used to measure each of the first-order latent variables. They were then used as indicators of the second-order latent variable (Rai et al., 2006). This time, the indicators were used as formative measures in the second-order construct following the same guidelines for constructing the formative/reflective factor model (Jarvis et al., 2003).

Hence, in the current study, each first-order construct, was replaced by its latent variable scores to measure the second-order constructs, namely, individual factors (IF), channel factors (CF), perceived benefits of a cooperative (PBC), perceived barriers to a cooperative (PB) and situational factors (SF), at the higher-order level (see Figures 6.3 and 6.4) as per the rules of the two-stage approach (Ringle et al., 2012; Wetzels et al., 2009). Here, the second-order formative construct, individual factors (IF), was operationalized as consisting of three constructs, namely, (IFS), experience (IFE) and involvement (IFI). The second-order construct, channel factors (CF), was measured by supplier influence (CFSI), horizontal competition (CFHC) and vertical conflict (CFVC). The second-order construct, perceived benefits of a cooperative (PBC), was measured through more income (PBCMI), alternative income (PBCAI) and compatibility (PBCC). The second-order construct, perceived barriers (PB), was measured by dishonesty of the leaders (PBDL), lack of trust (PBLT) and lack of unity (PBLU). The second-order construct, situational factors, was measured by government support (SFGS) and NGO support (SFNS). The second-order level of each construct is depicted by the latent variable scores of its corresponding first-order constructs. In the final model, the splitting of the channel factor constructs is also depicted, as with the other constructs, from the latent variable scores of its corresponding first-order constructs. The measurement of the second-order constructs IF, CF, PBC, PB and SF is depicted on Tables 6.13 and 6.14 for the crab fishers and crab suppliers, respectively.

6.2.3.5 Indicator weights for formative constructs

As mentioned before, the theoretical model of this research comprised five second-order formative constructs. The indicator weights, which provided information on

the relative importance of the formative items towards the formation of the corresponding latent construct, were calculated in order to assess the constructs. The weights for the indicators are presented in Tables 6.13 and 6.14 for the crab fishers and crab suppliers, respectively.

Table 6.13: Measurement of second-order formative constructs for crab fishers

Second-order Construct	First-order Constructs	Crab Fishers			
		Weight	***t*-value**	**Loading**	***t*-value**
Individual Factors (IF)	***IFEc***	-0.35	1.19	0.53	2.37
	IFIc	0.56	1.78	0.92	9.57
	IFSc	0.73	1.96	0.92	8.06
Channel Factors (CF)	***CFSIc***	-0.31	1.19	0.36	1.50
	CFHCc	0.76	1.45	0.75	1.54
	CFVCc	0.80	2.15	0.68	1.97
Perceived Benefits of a Cooperative (PBC)	***PBCAIc***	0.42	3.88	0.90	24.58
	PBCCc	0.08	0.98	0.45	4.80
	PBCMIc	0.62	6.19	0.95	38.82
Perceived Barriers to a Cooperative (PB)	***PBDLc***	0.74	1.70	0.79	1.73
	PBLTc	0.14	0.38	0.29	0.63
	PBLUc	0.54	1.75	0.69	1.96
Situational Factors (SF)	***SFGSc***	0.78	6.46	0.95	20.99
	SFNSc	0.35	2.24	0.74	7.41

As shown in the crab fishers' table, Table 6.13 above, the study found that all the first-order latent constructs, with the exception of CFHC, CHSI and PBLT, had significant weights and *t*-values with corresponding loadings and *t*-values; however, CFHC, CHSI and PBLT showed non-significant results for *t*-values in both the weights and loadings at the second-order level.

Table 6.14: Measurement of second-order formative constructs for crab suppliers

Second-order Construct	First-order Constructs	Crab Suppliers			
		Weight	*t*-value	Loading	*t*-value
Individual Factors (IF)	***IFEc***	- 0.01	0.01	0.79	2.18
	IFIc	0.79	0.85	0.99	2.66
	IFSc	0.26	0.31	0.87	2.54
Channel Factors (CF)	***CFSIc***	0.11	0.48	0.76	6.15
	CFHCc	- 0.08	0.32	- 0.26	0.95
	CFVCc	0.90	4.50	0.99	13.77
Perceived Benefits of a Cooperative (PBC)	***PBCAIc***	0.30	1.66	0.88	14.45
	PBCCc	0.18	1.59	0.39	2.91
	PBCMIc	0.69	3.87	0.96	25.39
Perceived Barriers to a Cooperative (PB)	***PBDLc***	- 0.17	0.60	0.31	1.06
	PBLTc	0.06	0.29	0.55	3.16
	PBLUc	1.03	7.17	0.99	10.51
Situational Factors (SF)	***SFGSc***	0.94	6.79	0.99	15.78
	SFNSc	0.16	0.56	0.46	1.81

As shown in Table 6.14, all the first-order latent constructs for the crab suppliers had significant weights, loadings and corresponding *t*-values, except for the constructs, CFHC and PBDL. The latter two construct scores showed a non-significant loading and *t*-values (below the threshold value) as well as corresponding weights and *t*-values.

6.2.3.6 Multicollinearity test for formative constructs

Multicollinearity is an undesirable property in formative models as it causes estimation difficulties (Diamantopoulos et al., 2008). To assess the collinearity among the first-order latent constructs, it is necessary to calculate the variance inflation factor (VIF) (threshold < 5) for formative constructs, as presented in Table 6.15 (Hair et al., 2011; Henseler et al., 2009).

Table 6.15: Collinearity test: VIF values for crab fishers and crab suppliers

Construct	Sub-Construct	Crab Fishers' VIF	Crab Suppliers' VIF
IF	IFE	2.14	2.94
	IFI	2.68	3.01
	IFS	3.48	3.19
CF	CFSI	1.69	2.03
	CFHC	1.07	1.05
	CFVC	1.60	2.09
PBC	PBCAI	2.30	2.58
	PBCC	1.19	1.05
	PBCMI	2.18	2.57
PB	PBDL	1.05	1.25
	PBLT	1.28	1.38
	PBLU	1.28	1.60
SF	SFGS	1.35	1.11
	SFNS	1.35	1.11

Table 6.15 shows the VIF values for all second-order formative constructs for the crab fishers and crab suppliers, that is, IF, CF, PBC, PB and SF at the sub-construct level. All the VIF values are below the threshold value (threshold < 5), thus proving that the model is free from the multicollinearity problem as each sub-construct score corresponds to the respective higher-order construct.

The assessment outcome for the second-order formative constructs revealed that all 14 first-order construct scores (latent variable scores) fulfilled the required measurement properties corresponding to the five higher-order constructs for the crab fishers and crab suppliers. Thus, from the above assessment, it is evident that the measurement model can be treated as the higher-order measurement model for both the crab fishers and crab suppliers. It is vital to successfully achieve the measurement model and refine it accordingly so it can be put forward for structural model analysis (Henseler et al., 2009). As shown in the above analysis, the measurement model has been found to be properly refined, fulfilling the required measurement properties through the use of the measurement items in a consistent manner. Therefore, the measurement model is now validated for the structural model analysis.

6.2.4 Assessment of the Structural Model

The structural model is evaluated through the statistical significance of path coefficients, path loadings and corresponding *t*-values between the constructs (Barclay et al., 1995; Hair et al., 2011). In the current study, the structural model consisted of nine independent and five dependent latent variables. The variances associated with the dependent variables determined the explanatory power of the proposed model. The path coefficients and *t*-values were calculated to address the effects of the constructs and their underlying relationships according to the proposed theoretical framework. The hypothesized relationships between the constructs could be calculated by a choice of two non-parametric approaches, namely, 'bootstrapping' or 'jackknifing' (Santosa et al., 2005; Gefen et al., 2000). Bootstrapping is popularly used within the PLS framework as it produces both a *t*-value and an R^2 value: the current study used this approach, considering it to be an advanced approach over the 'jackknifing' method (Chin, 1998b). The technique employed by bootstrapping to calculate the *t*-statistic is similar to the traditional *t*-test, and is also used to interpret the significance of the paths between the study's constructs (Barclay et al., 1995). Interpreted in a similar way to multiple regression analysis, the R^2 value is also used to indicate the explanatory power of exogenous variables within a model (Hair et al., 2011). In other words, this value estimates the variance associated with endogenous constructs; thus, the proposed overall model could be evaluated. It is important to note that PLS had some advantages as it was ideal for assessing the path loadings and structural relationships between the study constructs and could handle both formative and reflective constructs (Chin & Newsted, 1999; Hanlon, 2001): in addition, it did not require normal distribution of the data.

6.2.4.1 Path coefficients and t-values of the structural model

Figures 6.3 and 6.4 below show the path coefficients and *t*-values of the structural model for crab fishers and crab suppliers, respectively. A positive relationship between the constructs is determined by the positive value of a path coefficient and vice versa, while the *t*-value evaluates the significance between the constructs' relationships, as shown in both figures. In both models, 'attitude towards a cooperative (ATC)', as a first-order reflective construct, has been measured through the relational influence among the six second-order constructs: individual factors

(IF), channel factors (CF), perceived benefits of a cooperative (PBC), perceived barriers to a cooperative (PB), social influence (SI) and situational factors (SF). 'Intention to be engaged with a cooperative (INC)', also a first-order reflective construct, has been determined by the influence of three constructs: ATC, SI, and SF. Finally, perceived sustainable livelihood (PSL), as a first-order reflective construct, was modelled as the outcome of ATC and INC of the crab fishers and crab suppliers in the measurement model. The coefficients and corresponding *t*-values of the path relationships are shown in Table 6.16 for both crab fishers and crab suppliers.

Figure 6.3: Algorithm (path coefficients) and bootstrapping (*t*-values) output for crab fishers

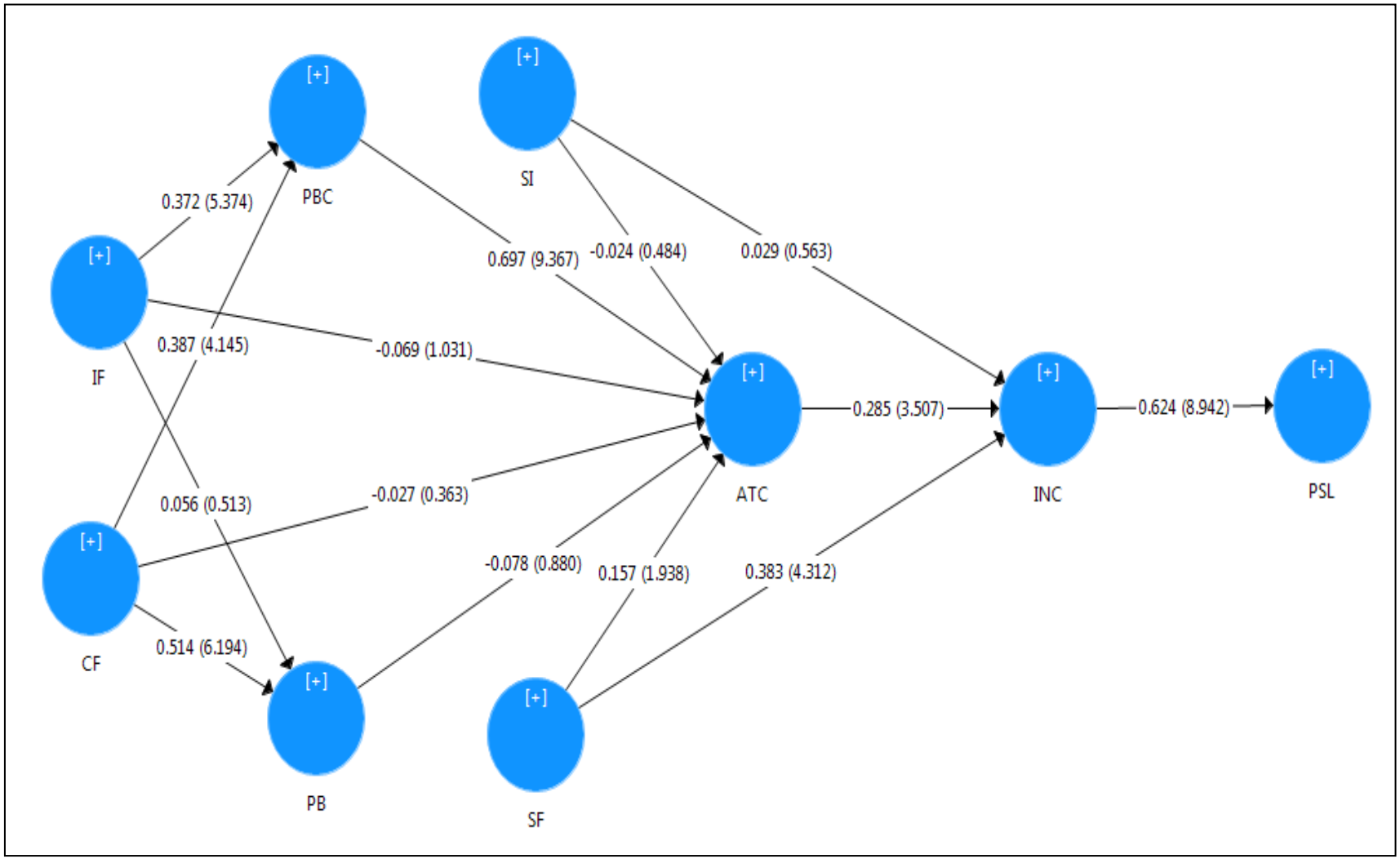


Figure 6.4: Algorithm (path coefficients) and bootstrapping (*t*-values) output for crab suppliers

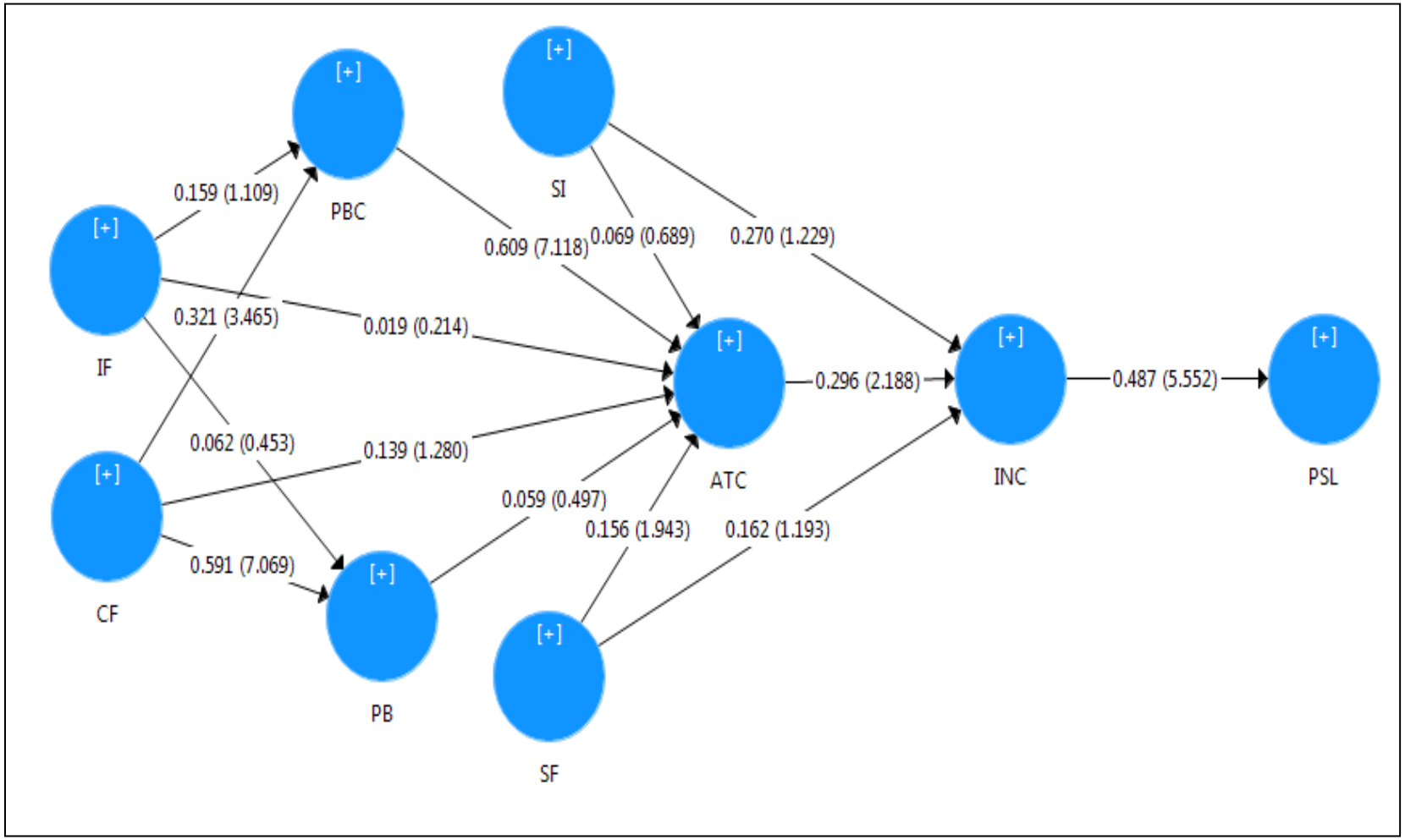


Table 6.16: Structural model with path coefficients (β) and *t*-values

Hypothesis	Path	Crab Fishers		Crab Suppliers	
		β-value	***t*-value**	**β-value**	***t*-value**
H1	IF → PBC	0.37	5.37	0.16	1.11
H2	IF → PB	0.06	0.51	0.06	0.45
H3	IF → ATC	-0.07	1.03	0.02	0.21
H4	CF → PBC	0.38	4.15	0.32	3.47
H5	CF → PB	0.51	6.19	0.59	7.07
H6	CF → ATC	-0.03	0.36	0.14	1.28
H7	PBC → ATC	0.70	9.37	0.61	7.12
H8	PB → ATC	-0.08	0.88	0.06	0.50
H9	SI → ATC	-0.02	0.48	0.07	0.69
H10	SI → INC	0.03	0.56	0.27	1.23
H11	SF → ATC	0.16	1.94	0.16	1.94
H12	SF → INC	0.38	4.31	0.16	1.19
H13	ATC → INC	0.29	3.51	0.30	2.19
H14	INC → PSL	0.62	8.94	0.49	5.55

The structural model was assessed by the path coefficients and corresponding *t*-values for all the constructs to justify the relationships between the constructs for both the crab fishers and crab suppliers. The path from CF → PBC (H4) was found to be positively significant for crab fishers which were not expected by the researcher. As mentioned earlier, CF is a second-order formative construct comprising three first-order constructs: supplier influence (CFSI), horizontal competition (CFHC) and vertical conflict (CFVC). Due to the unexpected outcome revealed in the analysis, the researcher decided to split the composite construct, CF, into three first-order constructs: CFSI, CFHC and CFVC and then to test the effect of each of these three factors on both PB and PBC. The results of the measurement models after splitting are shown in Tables 6.17 and 6.18 and in Figures 6.5 and 6.6 for crab fishers and suppliers, respectively.

Table 6.17: Measurement model of second-order formative constructs for crab fishers (splitting CF)

Second-order Construct	First-order Constructs	Crab Fishers			
		Weight	*t*-value	loading	*t*-value
Individual Factors (IF)	*IFEc*	-0.43	1.52	0.46	2.15
	IFIc	0.74	2.40	0.94	9.2
	IFSc	0.59	1.64	0.86	7.33
Perceived Benefits of a Cooperative (PBC)	*PBCAIc*	0.40	3.89	0.90	24.86
	PBCCc	0.08	1.10	0.45	5.15
	PBCMIc	0.64	6.84	0.96	42.93
Perceived Barriers to a Cooperative (PB)	*PBDLc*	-0.15	0.27	-0.18	0.30
	PBLTc	0.72	1.95	0.92	1.98
	PBLUc	0.43	1.83	0.73	2.36
Situational Factors (SF)	*SFGSc*	0.78	6.66	0.95	22.91
	SFNSc	0.35	2.31	0.74	7.46

Table 6.18: Measurement model of second-order formative constructs for crab suppliers (splitting CF)

Second-order Construct	First-order Constructs	Crab Suppliers			
		Weight	*t*- value	loading	*t*-value
Individual Factors (IF)	*IFEc*	0.03	0.04	0.81	2.20
	IFIc	0.71	0.77	0.98	2.69
	IFSc	0.32	0.39	0.89	2.70
Perceived Benefits of a Cooperative (PBC)	*PBCAIc*	0.32	1.72	0.88	14.76
	PBCCc	0.19	1.72	0.40	2.93
	PBCMIc	0.66	3.62	0.96	23.36
Perceived Barriers to a Cooperative (PB)	*PBDLc*	0.03	0.08	0.47	1.48
	PBLTc	-0.003	0.02	0.52	3.06
	PBLUc	0.99	4.40	1.00	6.33
Situational Factors (SF)	*SFGSc*	0.94	6.83	0.99	15.92
	SFNSc	0.16	0.57	0.46	1.86

Figure 6.5: Algorithm (path coefficients) and bootstrapping (*t*-values) output for crab fishers (after splitting CF)

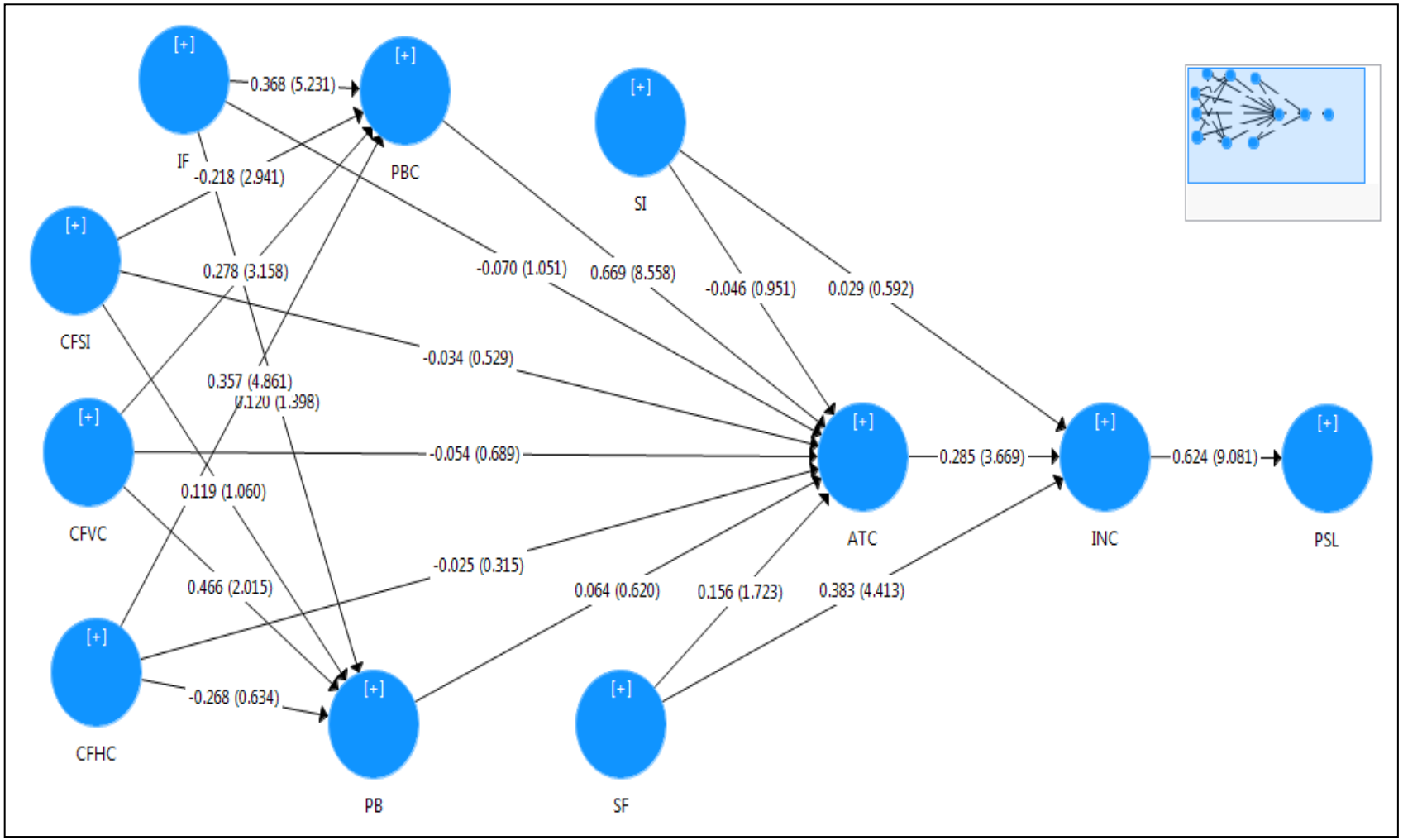


Figure 6.6: Algorithm (path coefficients) and bootstrapping (*t*-values) output for crab suppliers (after splitting CF)

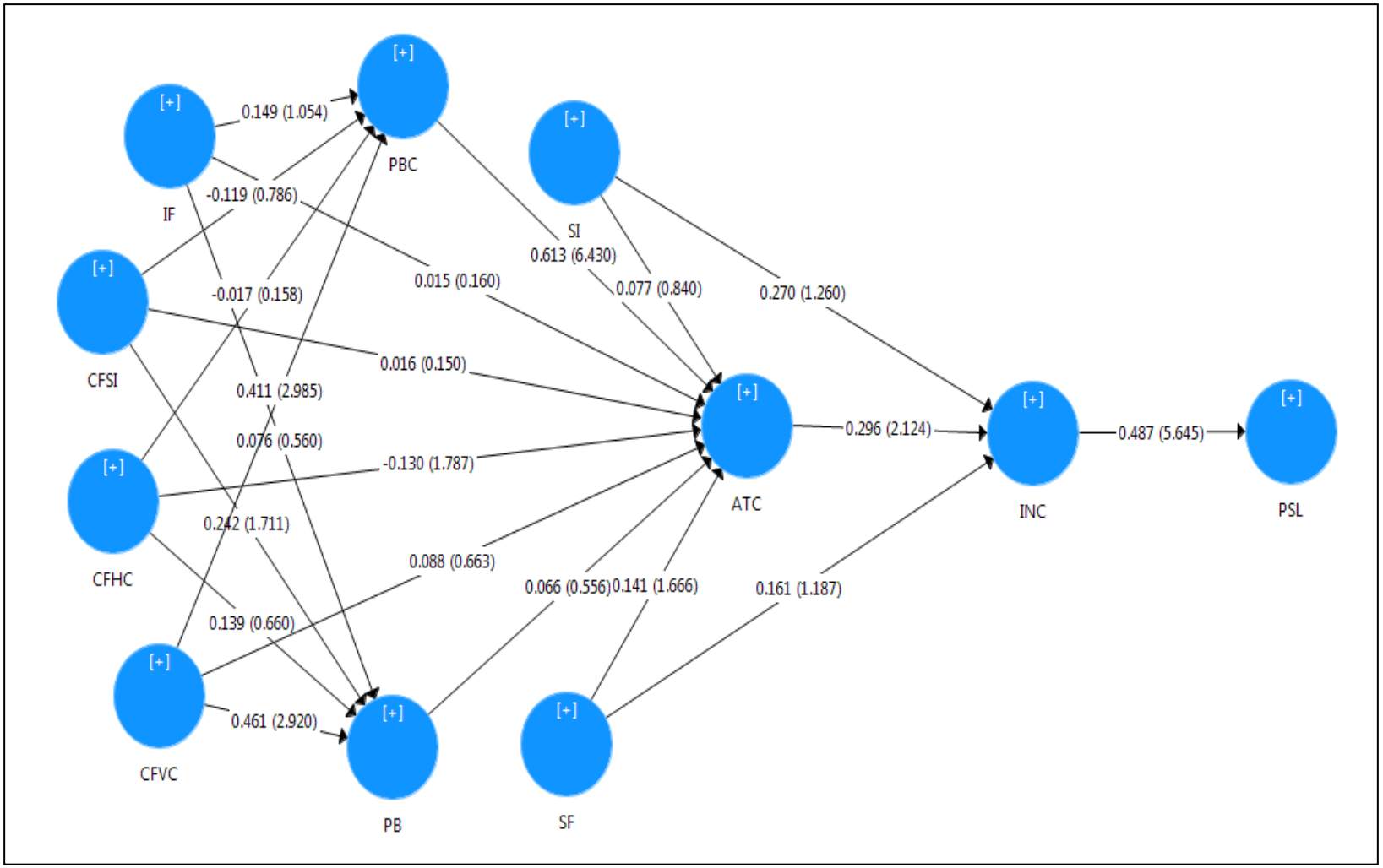


Table 6.19: Structural model of path relationships with path coefficient (β) values and *t*-values

Hypothesis	Path	Crab Fishers		Crab Suppliers	
		β-value	*t*-value	β-value	*t*-value
H1	IF → PBC	0.37	5.23***	0.15	1.05
H2	IF → PB	0.12	1.40	0.08	0.56
H3	IF → ATC	-0.07	1.05	0.02	0.16
H4a	CFSI → PBC	-0.22	2.94**	-0.12	0.79
H4b	CFHC → PBC	0.36	4.86***	-0.02	0.16
H4c	CFVC → PBC	0.28	3.16***	0.41	2.99***
H5a	CFSI → PB	0.12	1.06	0.24	0.71
H5b	CFHC → PB	-0.27	0.63	0.14	0.66
H5c	CFVC → PB	0.47	2.02**	0.46	2.92**
H6a	CFSI → ATC	-0.03	0.53	0.12	0.15
H6b	CFHC → ATC	-0.03	0.32	-0.13	1.79
H6c	CFVC → ATC	-0.05	0.69	0.09	0.66
H7	PBC → ATC	0.67	8.56***	0.61	6.43***
H8	PB → ATC	0.06	0.62	0.07	0.56
H9	SI → ATC	-0.05	0.95	0.08	0.84
H10	SI → INC	0.03	0.59	0.27	1.26
H11	SF → ATC	0.16	1.72	0.14	1.67
H12	SF → INC	0.38	4.41***	0.16	1.19
H13	ATC → INC	0.29	3.67***	0.30	2.12**
H14	INC → PSL	0.62	9.08***	0.49	5.65***

Note: Significant at *p < 0.05, **p < 0.01, ***p < 0.005, while the critical value is 1.96 at 5% level of significance (LOS)

6.2.4.2 Tests of hypotheses

Table 6.19 (Figures 6.5 and 6.6) shows the results of the hypotheses tests.

Hypothesis H1: Individual factors (IF) were found to have positive effects on the perceived benefits of a cooperative (PBC) (β = 0.37; t = 5.23) for the crab fishers. This research has proposed the establishment of a fisher's cooperative in the mud crab value chain to enhance the sustainable livelihood of the crab fishers; hence, the crab fishers' individual factors, such as skill, experience and

involvement, are related to predictions of the perceived benefits of the cooperative. However, for the crab suppliers' data, the link between IF and PBC was not found to be significant (β = 0.15; t = 1.05). As argued earlier in the hypotheses development chapter (Chapter 5), the crab suppliers' individual factors are not related here as this study's focus is on the establishment of a crab fishers' cooperative. Therefore, H1 is supported.

Hypothesis H2: Individual factors (IF) were not found to have a significant effect on perceived barriers (PB) to a cooperative for the crab fishers (β = 0.12; t = 1.40). Similar non-significant results were found for the crab suppliers (β = 0.08; t = 0. 56). As H2 hypothesized that individual factors would negatively influence the perceived barriers to a cooperative for crab fishers but not for crab suppliers; therefore, H2 is supported for crab suppliers only.

Hypothesis H3: The hypothesized relationship between individual factors (IF) and attitude towards a cooperative (ATC) was found to be not significant for both crab fishers (β = -0.07; t = 1.05) and crab suppliers (β = 0.02; t = 0.16). As individual factors were hypothesized to positively influence the attitude towards a cooperative for crab fishers but not for crab suppliers; hence H3 is supported only for the crab suppliers.

Hypothesis H4a: Under H4, it was hypothesized that channel factors (CF) would negatively influence the perceived benefits of a cooperative (PBC) for crab fishers but not for crab suppliers. Later, it was decided to split channel factors (CF) into CFSI (under H4a), CFHC (under H4b) and CFVC (under H4c) in order to find the respective influence of supplier influence (SI), horizontal competition (HC) and vertical conflict (VC) on PBC.

Under H4a, supplier influence (CFSI), as one of the channel factors (CF) was found to negatively influence perceived benefits of a cooperative (PBC) for the crab fishers (β = -0.22; t = 2.94). However, for crab suppliers, the link was found to be not significant (β = -0.12; t = 0.79). Therefore, CFSI negatively influenced PBC for crab fishers but not for crab suppliers. Therefore, H4a is supported.

Hypothesis H4b: Horizontal competition (CFHC), as one of the channel factors (CF), was found to positively influence perceived benefits of a cooperative

(PBC) (β = 0.36; t = 4.86) for the crab fishers. This is contrary to what was expected under H4 (channel factors will negatively influence PBC for the crab fishers). For crab suppliers, the link was not found to be significant (β = -0.02; t = 0.16) meaning that horizontal competition (CFHC) did not influence perceived benefits of a cooperative (PBC) for crab suppliers. In fact, crab suppliers benefited from horizontal competition between the crab fishers which enabled the suppliers to exploit the fishers more by giving them less opportunity for price negotiation. Therefore, H4b is supported for the crab suppliers only.

Hypothesis H4c: Vertical conflict (CFVC), as one of the channel factors (CF), was found to positively influence perceived benefits of a cooperative (PBC) (β = 0.28; t = 3.16) for crab fishers. The link was similarly found to be significant (β = 0.41; t = 2.99) for the crab suppliers. Under H4, channel factors (CF) were found to negatively influence the perceived benefits of a cooperative (PBC) for crab fishers but not for crab suppliers; however, under H4c, it was found that CFVC positively influenced PBC for both crab fishers and suppliers. Hence, H4c is not supported for both fishers and suppliers.

Hypothesis H5a: Under H5, it was hypothesized that channel factors (CF) would positively influence perceived barriers to a cooperative (PB) for crab fishers but not for crab suppliers. Later, it was decided to split channel factors (CF) into CFSI (under H5a), CFHC (under H5b) and CFVC (under H5c) in order to find the respective influence of supplier influence (SI), horizontal competition (HC) and vertical conflict (VC) on PB.

Supplier influence (CFSI), as one of the channel factors (CF), was found to not have a significant effect on perceived barriers to a cooperative (PB) (β = 0.12; t = 1.06) for the crab fishers. Similarly the effects of CFSI on PB were found to not be significant for crab suppliers (β = 0.24; t = 0.71). In line with H5, under H5a, the expectation was that CFSI would positively influence perceived barriers to a cooperative (PB) for crab fishers but not for crab suppliers. CFSI was found to not influence PB for either crab fishers or crab suppliers although the direction of the link was positive for both crab fishers and suppliers. Hence, H5a is supported only for the crab suppliers.

Hypothesis H5b: Horizontal competition (CFHC), as one of the channel factors (CF), was found to not have any significant negative effect on perceived barriers to a cooperative (PB) (β = -0.27; t = 0.63) for crab fishers. A similar non-significant effect for CFHC on PB was found for crab suppliers (β = 0.14; t = 0.66). Under H5b, the expectation was that CFHC would positively influence perceived barriers to a cooperative (PB) for crab fishers but not for crab suppliers; however, CFHC was found to not influence PB for either crab fishers or crab suppliers. Hence, H5b is supported only for the crab suppliers.

Hypothesis H5c: Vertical conflict (CFVC), as one of the channel factors (CF), was found to have a significant positive effect on perceived barriers to a cooperative (PB) (β = 0.47; t = 2.02) for crab fishers, as well as being significant for crab suppliers (β = 0.46; t = 2.92). Under H5c, the expectation was that CFVC would positively influence perceived barriers to a cooperative (PB) for crab fishers but not for crab suppliers; however, CFVC was found to significantly influence PB for both crab fishers and suppliers. So, H5c is supported only for the crab fishers.

Hypothesis H6a: Under H6, it was hypothesized that channel factors (CF) would negatively influence attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. Later, it was decided to split channel factors (CF) into CFSI (under H6a), CFHC (under H6b) and CFVC (under H6c) to find the respective influence of supplier influence (SI), horizontal competition (HC) and vertical conflict (VC) on ATC.

For crab fishers, supplier influence (CFSI), as one of the channel factors (CF), was found to not have any significant influence on ATC for either crab fishers (β = -0.03; t = 0.53) or for crab suppliers (β = 0.12; t = 0.15). In line with H6, under H6a, the expectation was that CFSI would negatively influence attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. However, CFSI was found to not have any significant influence on ATC for either crab fishers or for crab suppliers. Therefore, H6a is supported only for the crab suppliers.

Hypothesis H6b: For crab fishers, horizontal competition (CFHC), as one of the channel factors (CF), was found to not have any significant influence on ATC for either crab fishers (β = -0.03; t = 0.32) or for crab suppliers (β = -0.13; t = 1.79). Under H6b, the expectation was that CFHC would negatively influence attitude

towards a cooperative (ATC) for crab fishers but not for crab suppliers. However, CFHC was found to not have any significant influence on ATC either for crab fishers or for crab suppliers, although the direction of influence was found to be negative. Therefore, H6b is supported only for the crab suppliers.

Hypothesis H6c: For crab fishers, vertical conflict (CFVC), as one of the channel factors (CF), was found to not have any significant influence on attitude towards a cooperative (ATC) (β = -0.05; t = 0.69), with a similar result found for the crab suppliers (β = 0.09; t = 0.66). Under H6c, the expectation was that CFVC would negatively influence attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. However, CFVC was not found to have any significant influence on ATC for either crab fishers or for crab suppliers, although the direction of influence was found to be negative for crab fishers. Therefore, H6c is supported only for the crab suppliers.

Hypothesis H7: Perceived benefits of a cooperative (PBC) were found to have a significant positive influence on attitude towards a cooperative (ATC) for both crab fishers (β = 0.67; t = 8.56) and crab suppliers (β = 0.61; t = 6.43). Under H7, the expectation was that perceived benefits would positively influence attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. Hence, H7 is supported only for the crab fishers. Notably, the beta value for the crab fishers was higher than that of the crab suppliers. Thus, PBC was found to have a stronger positive influence on ATC for crab fishers compared to its influence on crab suppliers.

Hypothesis H8: Perceived barriers towards a cooperative (PB) were found to have a non-significant effect on attitude towards a cooperative (ATC) for the crab fishers (β = 0.06; t = 0.62) and also for the crab suppliers (β = 0.07; t = 0.56). Under H8, the expectation was that perceived barriers (PB) would negatively influence attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. Hence, H8 is supported only for the crab suppliers.

Hypothesis H9: Social influence (SI) was found to have no effect on attitude towards a cooperative (ATC) for crab fishers (β = -0.05; t = 0.95) and also for crab suppliers (β = 0.08; t = 0.84). Under H9, the expectation was that social influence (SI) would positively influence attitude towards a cooperative (ATC) for

crab fishers but not for crab suppliers. Hence, H9 is supported only for the crab suppliers.

Hypothesis H10: Social influence (SI) was found to have no influence on the intention to be engaged with a cooperative (INC) for crab fishers (β = 0.03; t = 0.59) and also for crab suppliers (β = 0.27; t = 1.26). Under H10, the expectation was that social influence (SI) would positively influence intention to be engaged with a cooperative (INC) for crab fishers but not for crab suppliers. Therefore, H10 is supported only for the suppliers.

Hypothesis H11: Situational factors (SF) (government and NGO support) were found to not have any significant effect on attitude towards a cooperative (ATC) for either crab fishers (β = 0.16; t = 1.72) or crab suppliers (β = 0.14; t = 1.67). Under H11, the expectation was that situational factors (SF) would have a positive impact on attitude towards a cooperative (ATC) for crab fishers but not for crab suppliers. Thus, H11 is supported for the crab suppliers.

Hypothesis H12: Under H12, the expectation was that situational factors (SF) would positively influence intention to be engaged with a cooperative (INC) for crab fishers but not for crab suppliers. From the data analysis, situational factors (SF) were found to positively influence crab fishers' intention to be engaged with a cooperative (INC) (β = 0.38; t = 4.41). However, for crab suppliers, this link was not found to be significant (β = 0.16; t = 1.19). Hence, H12 is supported for both the fishers and suppliers.

Hypothesis H13: In H13, it was hypothesized that attitude towards a cooperative (ATC) would positively influence intention to be engaged with a cooperative (INC) for crab fishers but not for crab suppliers. The attitude towards a cooperative (ATC) of crab fishers was found to have a significant positive effect (β = 0.29; t = 3.67) on their intention to be engaged with a cooperative (INC). This link was also found to be significant for crab suppliers (β = 0.30; t = 2.12). Thus, H13 is supported only for the crab fishers.

Hypothesis H14: In H14, it was hypothesized that intention to be engaged with a cooperative (INC) would positively influence perceived sustainable livelihood (PSL) of crab fishers but not of crab suppliers. It was found that

intention to be engaged with a cooperative (INC) had a significant positive effect on perceived sustainable livelihood (PSL) for both crab fishers (β = 0.624; t = 9.08) and crab suppliers (β = 0.49; t = 5.65). Thus, H14 is supported only for the crab fishers.

A summary of the data analysis results corresponding to H1 to H14 is shown in Table 6.20.

Table 6.20: Results of hypotheses tests for crab fishers and crab suppliers

SL No.	Hypotheses	Result
H1	Individual factors positively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Supported
H2	Individual factors negatively influence the perceived barriers to a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H3	Individual factors positively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H4a	Supplier influence, as one of the channel factors, negatively influences the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Supported
H4b	Horizontal competition, as one of the channel factors, negatively influences the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H4c	Vertical conflict, as one of the channel factors, negatively influences the perceived benefits of a cooperative for crab fishers but not for crab suppliers.	Not Supported
H5a	Supplier influence, as one of the channel factors, positively influences the perceived barriers to a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H5b	Horizontal competition, as one of the channel factors, positively influences the perceived	Supported only for the suppliers

	barriers to a cooperative for crab fishers but not for crab suppliers.	
H5c	Vertical conflict, as one of the channel factors, positively influences the perceived barriers to a cooperative for crab fishers but not for crab suppliers.	Supported only for the fishers
H6a	Supplier influence, as one of the channel factors, negatively influences attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H6b	Horizontal competition, as one of the channel factors, negatively influences the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H6c	Vertical conflict, as one of the channel factors negatively influences the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H7	Perceived benefits positively influence the attitude towards adopting the cooperative for crab fishers but not for crab suppliers	Supported only for the fishers
H8	Perceived barriers to a cooperative negatively influence the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H9	Social influence has a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H10	Social influence has a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H11	Situational factors have a positive impact on the attitude towards a cooperative for crab fishers but not for crab suppliers.	Supported only for the suppliers
H12	Situational factors have a positive impact on the intention to be engaged with a cooperative for crab fishers but not for crab suppliers.	Supported
H13	The attitude towards a cooperative positively influences the intention to be engaged with a	Supported only for the fishers

	cooperative for crab fishers but not for crab suppliers.	
H14	The intention to be engaged with a cooperative positively influences the perceived sustainable livelihood for crab fishers but not for crab suppliers.	Supported only for the fishers

6.2.4.3 Nomological validity and coefficient of determination (R^2)

The study's structural model as discussed earlier reflects the nomological validity of the constructs. The nomological validity of the endogenous variables of the model was examined by their R^2 values (Santosa et al., 2005). Falk and Miller (1992) proposed that the minimum R^2 value should be 0.10 which, in turn, would ensure the nomological validity of the model. The researcher in the current study used the nomological test to examine the adequacy of the multidimensional structure of the constructs, as developed by Edwards (2001) and Mackenzie (2012), to validate the dimensions in this study. The variances associated with the endogenous variables determined the explanatory power of the model, with this shown in Table 6.21.

Table 6.21: Nomological validity for multidimensional constructs

Constructs	**Crab Fishers** R^2	**Crab Suppliers** R^2
Attitude towards a Cooperative (ATC)	0.52	0.63
Intention to be Engaged with a Cooperative (INC)	0.34	0.26
Perceived Sustainable Livelihood (PSL)	0.39	0.24
Perceived Barriers to a Cooperative (PB)	0.37	0.42
Perceived Benefits of a Cooperative (PBC)	0.29	0.14

As shown in Table 6.21 above, the variance (derived from R^2) was found to be 39% for crab fishers and 24% for crab suppliers for perceived sustainable livelihood (PSL). Perceived benefits of a cooperative (PBC) achieved variances of 29% and 14%, respectively, in relation to individual factors (IF), supplier influence (CFSI), horizontal competition (CFHC) and vertical conflict (CFVC). Perceived

barriers (PB) accounted for individual factors (IF), supplier influence (CFSI), horizontal competition (CFHC) and vertical conflict (CFVC) showing variances of 37% and 42% for crab fishers and crab suppliers, respectively. Again, attitude towards a cooperative was accounted for by IF, CFSI, CFHC, CFVC, PB, PBC, SI and SF. Finally, both models indicated 34% and 26% variance for the intention to be engaged with a cooperative (INC) for crab fishers and crab suppliers, respectively, with this accounted for by SI, SF and ATC. Thus, the structural model confirmed the nomological validity between the constructs.

6.2.4.4 Effect size (f2)

The effect size (f^2) was also calculated with the R^2 values for the endogenous constructs for this study. The effect size (f^2) is the measure of the impact of a specific predictor construct on an endogenous construct (Aguinis et al., 2005). According to Cohen (1988), the rule of thumb to evaluate $\boldsymbol{f}^2$ values is 0.02, 0.15 and 0.35 for small, medium and large effect sizes, respectively. Thus, the effect size (f^2) for the endogenous constructs is shown in Table 6.22 and Table 6.23 for the crab fishers and the crab suppliers, respectively.

Table 6.22: Effect size (f^2) for crab fishers

Constructs	ATC	INC	PB	PBC	PSL
ATC		0.096			
CFHC	0.001		0.105	0.165	
CFSI	0.001		0.013	0.039	
CFVC	0.003		0.207	0.066	
IF	0.008		0.021	0.180	
INC					0.638
PB	0.005				
PBC	0.517				
SF	0.034	0.165			
SI	0.004	0.001			

As depicted in Table 6.22, the effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC, IF, PBC, PB, SF and SI on ATC are 0.001, 0.001, 0.003, 0.008, 0.517, 0.005, 0.034 and 0.004, respectively. In a similar way, the effect size

(f^2) of the antecedent constructs ATC, SI and SF on INC are 0.096, 0.001 and 0.165, respectively. The effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC and IF on PB are 0.105, 0.013, 0.207 and 0.021, respectively. Finally, the effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC and IF on PBC are 0.165, 0.039, 0.066 and 0.180, respectively, for the crab fishers' model and the effect size (f^2) of INC on PSL is 0.638.

Table 6.23: Effect size (f^2) for crab suppliers

Constructs	ATC	INC	PB	PBC	PSL
ATC		0.092			
CFHC	0.041		0.031	0.000	
CFSI	0.000		0.049	0.008	
CFVC	0.008		0.175	0.094	
IF	0.001		0.010	0.025	
INC					0.310
PB	0.005				
PBC	0.767				
SF	0.044	0.028			
SI	0.011	0.094			

Similarly, as depicted in Table 6.23, the effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC, IF, PB, PBC, SF and SI on ATC are 0.041, 0.000, 0.008, 0.0001, 0.005, 0.767, 0.044 and 0.011, respectively. In a similar way, the effect size (f^2) of the antecedent constructs ATC, SF and SI on INC are 0.092, 0.028 and 0.094, respectively. The effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC and IF on PB are 0.031, 0.049, 0.175 and 0.010, respectively. Finally, the effect size (f^2) of the antecedent constructs CFHC, CFSI, CFVC and IF on PBC are 0.000, 0.008, 0.094, and 0.025, respectively, for the crab fishers' model and the effect size (f^2) of INC on PSL is 0.310.

6.2.5 Mediation Analysis of Perceived Benefits (PBC), Perceived Barriers (PB) and Attitude (ATC)

Mediation exists when at least one intervening variable or mediator between the independent and dependent variables affects the relationship between them (Baron & Kenny, 1986). In the current study, the mediating roles of perceived benefits, perceived barriers and attitude went through the four-step procedure of Baron and Kenny (1986). This is widely used in the literature (e.g. Sarkis et al., 2010; Wong et al., 2015) and, therefore, was followed. As per the four-step procedure, the relationships between the variables must satisfy all of the following conditions: (1) the independent variable should influence the dependent variable; (2) the independent variable should influence the mediating variable; (3) the mediating variable should influence the dependent variable; and, finally (4) the effect of the independent variable on the dependent variable should diminish or still be significant (in the case of partial mediation) or become no longer significant or insignificant (in the case of full mediation) after controlling for the effects of the mediating variable (Baron & Kenny, 1986).

Again, as mentioned earlier, the effects of channel factors (CF) were split in order to examine the respective role of supplier influence (CFSI), horizontal competition (CFHC) and vertical conflict (CFVC) on perceived benefits and perceived barriers (PB). Consequently, this led the researcher to test the mediation of PBC (under H16a, H16b, H16c) and PB (under H17a, H17b, H17c) in relationships between CFSI, CFHC and CFVC with ATC. Thus, the researcher tested the mediation hypotheses H15, H16a, H16b, H16c, H17a, H17b, H17c, H18 and H19 using the four-step procedure for testing mediation. The mediation test results are discussed in the following pages and, for the crab fishers, are shown in the figures from Figure 6.7 to Figure 6.15. Finally, a summary of the mediation results is shown in Table 6.24.

6.2.5.1 Mediating role of PBC

a) In the relationship between IF and ATC

Table 6.24 shows that, for the crab fishers, the relationships are not significant between the independent variable (IF) and the mediator (PBC) as well as between

the mediator (PBC) and the dependent variable (ATC). The link between the independent variable (IF) and the dependent variable (ATC), in the absence of the mediator's influence, is significant. Finally, the indirect effect of the IF → ATC link is significant (Baron & Kenny, 1986). Therefore, PBC fully mediates the relationship between IF and ATC (Figure 6.7), showing that H15 is supported for the crab fishers.

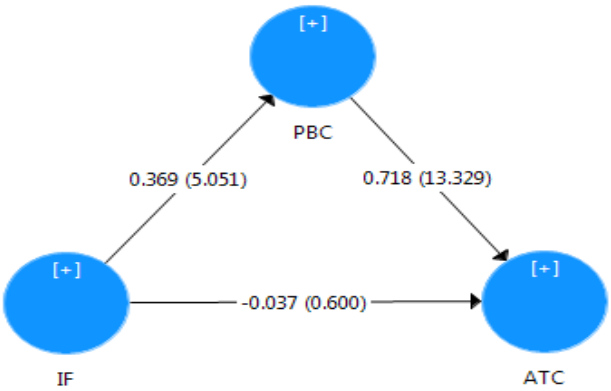


Figure 6.7: Mediating role of PBC in the relationship between IF and ATC

b) In the relationship between crab fishers' suppliers' influence (CFSI) and ATC

Table 6.24 shows that, for crab fishers, the link between the independent variable (CFSI) and the mediator (PBC) as well as the relationship between the mediator (PBC) and the dependent variable (ATC) are found to be not significant. The link between the independent variable (CFSI) and the dependent variable (ATC), in the absence of the mediator's influence, is also not significant. Finally, the indirect effect for the CFSI → ATC link is not significant (Baron & Kenny, 1986). Therefore, PBC does not have a mediation role between CFSI and ATC for the crab fishers (Figure 6.8); that is, H16a is not supported.

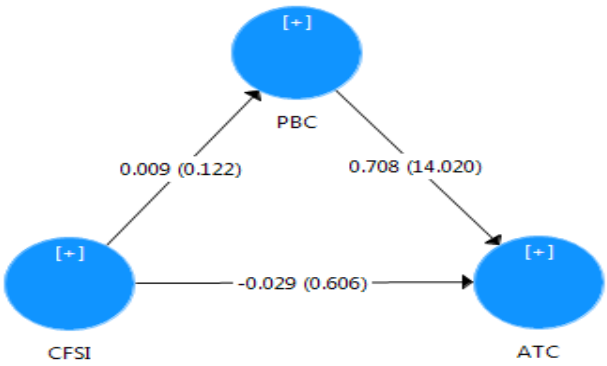


Figure 6.8: Mediating role of PBC in the relationship between CFSI and ATC

c) In the relationship between crab fishers' horizontal competition (CFHC) and ATC

Table 6.24 shows that, for the crab fishers, the link between the independent variable (CFHC) and the mediator (PBC) as well as the relationship between the mediator (PBC) and the dependent variable (ATC) are found to be not significant. The link between the independent variable (CFHC) and the dependent variable (ATC), in the absence of the mediator's influence, is significant. Finally, the indirect effect of the CFHC → ATC link is also significant (Baron & Kenny, 1986). Therefore, PBC fully mediates the relationship between CFHC and ATC (Figure 6.9) for the crab fishers; that is, H16b is supported.

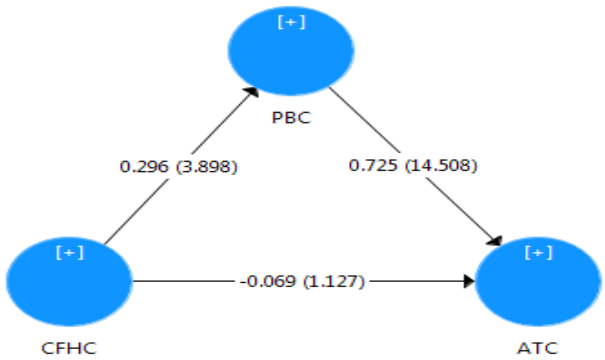


Figure 6.9: Mediating role of PBC in the relationship between CFHC and ATC

d) In the relationship between crab fishers' vertical conflict (CFVC) and ATC

Table 6.24 shows that, for the crab fishers, the link between the independent variable (CFVC) and the mediator (PBC) as well as the relationship between the mediator (PBC) and the dependent variable (ATC) are found to be not significant. The link between the independent variable (CFVC) and the dependent variable (ATC), in the absence of the mediator's influence, is also not significant. Finally, the indirect effect of the CFVC → ATC link is not significant (Baron & Kenny, 1986). Therefore, PBC does not have a mediation role between CFVC and ATC (Figure 6.10) for the crab fishers; that is, H16c is not supported.

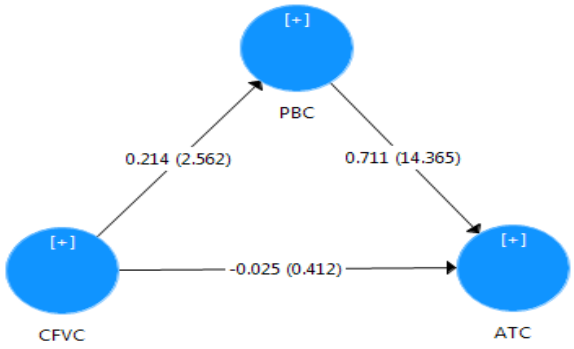


Figure 6.10: Mediating role of PBC in the relationship between CFVC and ATC

6.2.5.2 Mediating roles of PB

a) In the relationship between CFSI and ATC

For the crab fishers, Table 6.24 shows that the relationship between the independent variable (CFSI) and the mediator (PB) was significant, but that the relationship between the mediator (PB) and the dependent variable (ATC) was not significant. The link between the independent variable (CFSI) and the dependent variable (ATC), in the absence of the mediator's influence, is also not significant. However, the indirect effect of the CFSI → ATC link is not found to be significant (Baron & Kenny, 1986). Therefore, PB does not play a mediating role between CFSI and ATC(Figure 6.11), and H17a is not supported for the crab fishers.

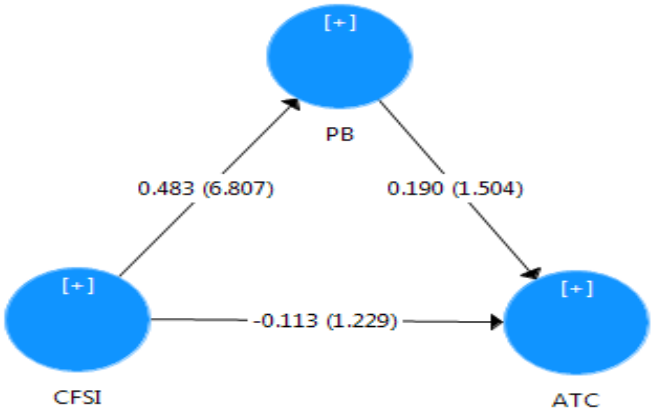


Figure 6.11: Mediating role of PB in the relationship between CFSI and ATC

b) In the relationship between CFHC and ATC

For the crab fishers, Table 6.24 shows that the relationship between the independent variable (CFHC) and the mediator (PB) was significant but that the relationship between the mediator (PB) and the dependent variable (ATC) was also significant. The link between the independent variable (CFHC) and the dependent variable (ATC), in the absence of the mediator's influence, is also significant. However, the indirect effect for the CFHC → ATC link is not found to be significant (Baron & Kenny, 1986). Therefore, PB does not play a mediating role between CFHC and ATC (Figure 6.12), and H17b is not supported for the crab fishers.

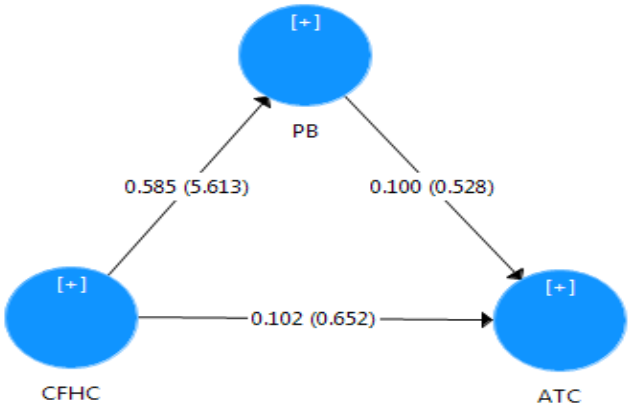


Figure 6.12: Mediating role of PB in the relationship between CFHC and ATC

c) In the relationship between CFVC and ATC

For the crab fishers, Table 6.24 shows that the relationship between the independent variable (CFVC) and the mediator (PB) was significant but that the relationship between the mediator (PB) and the dependent variable (ATC) was also significant. The link between the independent variable (CFVC) and the dependent variable (ATC), in the absence of the mediator's influence, is also significant at 10% level of significance (LOS). However, the indirect effect of the CFVC → ATC link is found to be significant (Baron & Kenny, 1986). Therefore, PB mediates between CFVC and ATC (Figure 6.13), and H17c is supported for the crab fishers.

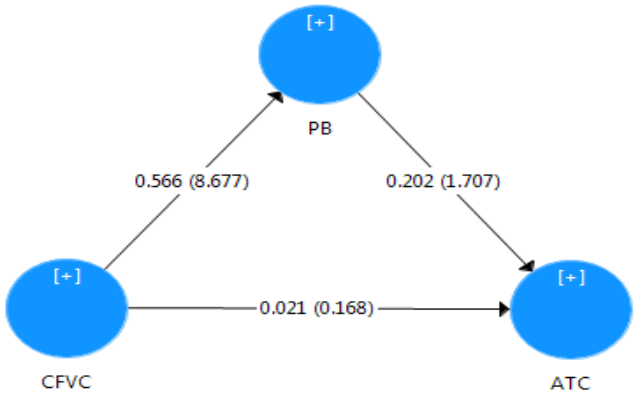


Figure 6.13: Mediating role of PB in the relationship between CFSI and ATC

6.2.5.3 Mediating role of ATC

a) In the relationship between SI and INC

For the crab fishers, Table 6.24 shows that the relationship between the independent variable (SI) and the mediator (ATC) as well as the relationship between the mediator (ATC) and the dependent variable (INC) are significant. The link between the independent variable (SI) and the dependent variable (INC), in the absence of the mediator's influence, is also significant. Finally, the indirect effect of the SI → INC link is not significant (Baron & Kenny, 1986). Therefore, ATC does not mediate the relationship between SI and INC (Figure 6.14) for the crab fishers, and H18 is not supported for the crab fishers.

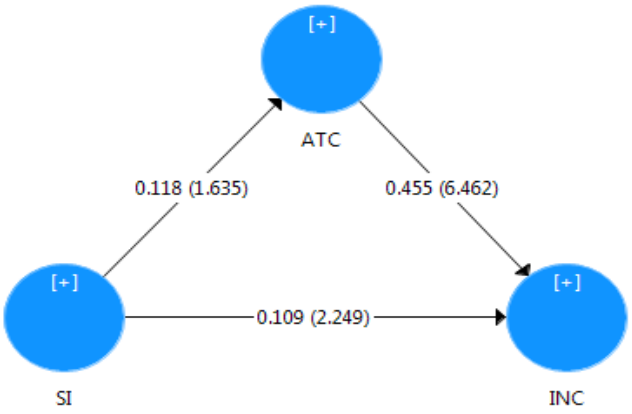


Figure 6.14: Mediating role of ATC in the relationship between SI and INC

b) In the relationship between SF and INC

Table 6.24 shows that for the crab fishers the relationship between the independent variable (SF) and the mediator (ATC) as well as the relationship between the mediator (ATC) and the dependent variable (INC) are significant. The link between the independent variable (SF) and the dependent variable (INC), in the absence of the mediator's influence, is also significant. Finally, the indirect effect of the SF → INC link is significant (Baron & Kenny, 1986). Therefore, ATC partially mediates the relationship between SF and INC (Figure 6.15) for the crab fishers, and H19 is partially supported for the crab fishers.

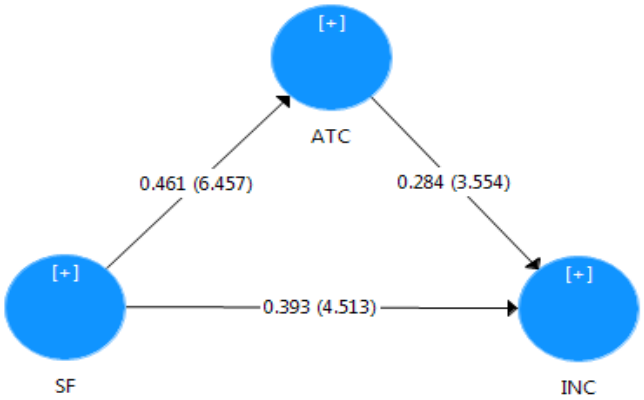


Figure 6.15: Mediating role of ATC in the relationship between SF and INC

Table 6.24: Results of mediation analysis of the crab fishers' model

Hypotheses	Structural model	Path coefficients			Mediation effect
		Direct effect	Indirect effect	Total effect	
H15 (PBC mediates the relationship between IF and ATC)	IF → ATC	0.25 (t = 2.43)			Full Mediation
	IF → PBC	0.39 (t = 5.77)			
	PBC → ATC	0.71 (t = 14.62)			
	IF → ATC (with presence of PBC)	-0.04 (t = 0.61)	0.27 (t = 4.41)	0.23	
H16a (PBC mediates the relationship between CFSI and ATC)	CFSI → ATC	-0.07 (t = 0.54)			No Mediation
	CFSI → PBC	-0.15 (t = 0.79)			
	PBC → ATC	0.71 (t = 14.25)			
	CFSI → ATC (with presence of PBC)	-0.03 (t = 0.61)	0.01 (t = 0.12)	-0.02	
H16b (PBC mediates the relationship between CFHC and ATC)	CFHC → ATC	0.16 (t= 2.03)			Full Mediation
	CFHC → PBC	0.33 (t = 4.22)			
	PBC → ATC	0.71 (t = 15.27)			
	CFHC → ATC (with presence of PBC)	-0.07 (t = 1.13)	0.21 (t = 3.74)	0.15	
H16c (PBC mediates the relationship between CFVC and ATC)	CFVC → ATC	0.16 (t = 1.53)			No Mediation
	CFVC → PBC	0.25 (t = 3.52)			
	PBC → ATC	0.71 (t = 14.42)			
	CFVC → ATC (with presence of PBC)	-0.03 (t = 0.41)	0.15 (t = 2.46)	0.13	
H17a (PB mediates the relationship between CFSI and ATC)	CFSI → ATC	-0.07 (t = 0.53)			No Mediation
	CFSI → PB	0.49 (t = 8.50)			
	PB → ATC	0.28 (t = 3.74)			
	CFSI → ATC (with presence of PB)	-0.11 (t = 1.23)	0.09 (t = 1.53)	-0.02	

H17b (PB mediates the relationship between CFHC and ATC)	CFHC → ATC	0.16 (*t* = 2.13)			No Mediation
	CFHC → PB	0.59 (*t* = 5.95)			
	PB → ATC	0.28 (*t* = 3.84)			
	CFHC → ATC (with presence of PB)	0.10 (*t* = 0.65)	0.06 (*t* = 0.51)	0.16	
H17c (PB mediates the relationship between CFVC and ATC)	CFVC → ATC	0.16 (*t* = 1.76)			Full Mediation
	CFVC → PB	0.57 (*t* = 8.74)			
	PB → ATC	0.28 (*t* = 3.79)			
	CFVC → ATC (with presence of PB)	0.02 (*t* = 0.17)	0.12 (*t* = 1.64)*	0.14	
H18 (ATC mediates the relationship between SI and INC)	SI → INC	0.19 (*t* = 3.32)			No Mediation
	SI → ATC	0.15 (*t* = 1.55)			
	ATC → INC	0.47 (*t* = 6.31)			
	SI → INC (with presence of ATC)	0.11 (*t* = 2.25)	0.05 (*t* = 1.49)	0.16	
H19 (ATC mediates the relationship between SF and INC)	SF → INC	0.53 (*t* = 6.90)			Partial Mediation
	SF → ATC	0.46 (*t* = 6.35)			
	ATC → INC	0.47 (*t* = 6.53)			
	SF → INC (with presence of ATC)	0.39 (*t* = 4.51)	0.13 (*t* = 3.12)	0.52	

Note: * Significant at 10% level of significance

6.3 SUMMARY

This chapter presented the results of the quantitative analysis of the survey conducted among the key crab value chain members of Bangladesh, the crab fishers and crab suppliers. The study employed partial least squares-based structural equation modelling (PLS-SEM) with a data set from 185 crab fishers and a data set from 89 crab suppliers. Furthermore, this chapter focused on the nature of the latent variables under study (reflective and formative) and justified the use of the PLS

technique as the main analytical tool. The procedures of data collection, data screening (by investigating possible biases) and data analysis were also outlined in the chapter. In addition, the chapter covered the measurement model by estimating the relevant reliability and validity of the constructs. Finally, the chapter focused on the tests of the hypotheses (covering both direct and mediating hypotheses), the nomological validity and the coefficient of determination as well as the effect size of the structural model. The implications of these results are discussed in Chapter 7.

CHAPTER 7

DISCUSSION AND IMPLICATIONS

7.0 INTRODUCTION

This chapter is used to discuss the results and interpretation of the qualitative and quantitative data analysis covered in Chapters 4 and 6, respectively. The quantitative data analysis results, based on partial least squares-based structural equation modelling (PLS-SEM), manifest the degree and magnitude of the relationships between the constructs. The findings are discussed in line with the hypothesized relationships between the model's different constructs which are guided by the research objectives. The chapter is structured as follows: first, the key objectives of the study are reiterated and how these objectives are attained is then outlined. Next, the hypotheses relating to individual factors are discussed. This is followed by discussion of the hypotheses relating to channel factors, perceived benefits, perceived barriers, attitude and intention towards a cooperative, and, finally, the hypotheses relating to a perceived sustainable livelihood.

7.1 KEY OBJECTIVES OF THE RESEARCH

The key purpose of this research is to explore three research questions: (a) what are the impacts of the existing mud crab value chain on the sustainable livelihood of crab fishers in coastal Bangladesh? (b) how can the social business model be used to develop an improved mud crab value chain to enrich the livelihood of crab fishers? and (c) Is the improved cooperative-based value chain acceptable to the various stakeholders of the mud crab industry? In an effort to address these research questions, the study was guided by the following specific objectives: (i) to investigate the impact of the existing mud crab value chain on the livelihood of channel members with a special focus on the livelihood of crab fishers; (ii) to explore how the social business model can be used to develop an improved mud crab value chain; (iii) to identify the factors that influence the acceptability of the new mud crab value chain by value chain participants with a special focus on crab fishers; (iv) to examine the effects of adopting the new mud crab value chain on the livelihood of crab fishers. In the following sections, general discussion relating to each research objective is outlined.

7.2 DISCUSSION RELATING TO OBJECTIVE 1 AND OBJECTIVE 2

The first and second research objectives of this study have been investigated through a qualitative field study, details of which have been outlined in Chapter 4. Under the first research objective, the impact of the existing mud crab value chain on the livelihood of crab fishers has been investigated. It has been revealed that the livelihood of the crab fishers is in vulnerable situation as they suffer from lack of access to five key resource or capital bases (natural capital, physical capital, social capital, human capital and financial capital) that are necessary for a sustainable livelihood. For example, the crab fishers do not have any land of their own to use for crab farming. Access to land can be transformed into income-generating activities; hence, a lack of access to land contributes to their livelihood vulnerability. In addition, as a result of the lack of access to pure drinking water, crab fishers suffer from frequent episodes of illness and poor health that impair their capability to catch crab for their livelihood. In terms of physical capital, most crab fishers live in very poor housing conditions, with houses typically made of mud and bamboo with straw or leaves forming the roof. They do not even have adequate fishing gear, a fishing boat or a net of their own. The crab fishers are usually inhibited by being from hereditary low-caste minority groups (predominantly Hindu or Buddhist), leading to their position in a disadvantaged social system in terms of social capital. Those within this low-caste system are usually neglected by and isolated from mainstream society which adversely affects their livelihood and their profession of crab fishing. Moreover, in the current value chain, the crab fishers are strongly dominated by the crab suppliers: not only are the suppliers socially powerful, but they also control market information with the crab fishers not having access to anyone other than the local suppliers to whom to sell their crab catches. To eradicate these kinds of vulnerable livelihood conditions and the undue dominance of the crab suppliers, crab fishers are eager to bring about a change in the existing mud crab value chain.

To revise the current mud crab value chain (to help the crab fishers achieve a sustainable livelihood), this research proposes a revised cooperative-based mud crab value chain where the cooperative will be run based on the principles of the social business model (Yunus, 2009) of Professor Muhammed Yunus. Hence, under

the second objective, this research suggests a new value chain for the distribution of mud crab from the rural coastal areas where a fishers' cooperative will unite the crab fishers and crab collectors, integrating the relevant activities of crab catching, cleaning, grading, packing, storing, etc. which are usually done by different value chain participants. The cooperative will be run under the principles of cooperation, as indicated in the social business model, and not those of competition. Instead of selling raw crabs to the suppliers in an isolated manner (based on competitive principles), under the new value chain, the crab fishers will sell in a unified manner, thus increasing their bargaining capacity, ensuring a better and fairer price and also ensuring alternative income sources for their family members. The qualitative field study thus explores relevant factors such as individual factors, channel factors, benefits of and barriers to cooperative, and social and situational factors that are likely to influence the adoption of the new cooperative-based mud crab value chain. These influencing factors are guided by the social business model with their effects examined, using a quantitative survey, based on the intention of value chain members to adopt the cooperative.

7.3 DISCUSSION RELATING TO OBJECTIVE 3 AND OBJECTIVE 4

The third objective of this study was to investigate the factors that influence the acceptability of the new mud crab value chain by various value chain participants. Next, the fourth objective of the study was to examine whether the new proposed value chain will contribute to the sustainable livelihood for the crab fishers. The researcher addressed these two objectives using a quantitative approach after collecting input from the qualitative field study. To be specific, the researcher conducted a survey among the crab fishers and crab suppliers of rural Bangladesh (the details of the survey and the relevant data analysis were outlined in Chapters 4 and 6, respectively). The key constructs and influencing factors were determined from the existing literature, were chiefly guided by the social business concept and were verified through the qualitative field study. The factors that were examined in terms of having a role in adopting the new cooperative-based mud crab value chain comprise: individual factors (skill, experience and involvement); channel factors (supplier influences, horizontal competition and vertical conflict); perceived benefits (more income, alternative income and compatibility); perceived barriers

(dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among the channel members); social influence (family influence and peer influence); and situational factors (government support and NGO support).

This research has examined the role of the above-mentioned factors in the adoption of the cooperative from the viewpoints of both the crab fishers and suppliers. As indicated in Objectives 3 and 4, crab fishers are the primary target for this research. In addition, this research focuses on crab suppliers as they are directly linked with the crab fishers whose daily activities are influenced by the suppliers. Crab fishers on their own cannot adopt the cooperative-based new value chain unless it is also supported by the crab suppliers. Hence, both crab fishers and suppliers should understand and agree to the cooperative's arrangements and not resist them, so they can engage with and even form the cooperative. Together, they also need to recognize the potential benefits from the cooperative (Pomeroy et al., 2001), and that it should also lead to attaining a sustainable livelihood for the crab fishers. Consequently, the hypotheses of the study reflect the viewpoints of both crab fishers and suppliers. In the following sections, discussions relating to the hypotheses and the factors that influence the adoption of the cooperative leading to a sustainable livelihood for the crab fishers, are outlined.

7.3.1 Discussion on Hypotheses regarding Individual Factors (IF)

In line with Objective 3, this study examines the relationship between individual factors, such as skill, experience and involvement, with perceived benefits of and perceived barriers to adopting a new cooperative-based mud crab value chain. The effects of individual factors on perceived benefits, perceived barriers and attitude towards a cooperative were analysed for both crab fishers and suppliers under the hypotheses H1 (IF→PBC), H2 (IF→PB) and H3 (IF→ATC), respectively. The findings revealed that H1 (IF→PBC) is supported as a significant positive relationship has been found between individual factors and perceived benefits ($\beta = 0.37$; $t = 5.37$) for crab fishers, whereas this path is not found to be significant for crab suppliers ($\beta = 0.15$; $t = 1.05$). On the other hand, H2 (IF→PB) and H3 (IF→ATC) is supported only for the suppliers as the paths were found to be non-significant for both crab fishers and suppliers. Individual factors were not found to have any significant relationships with perceived barriers (for fishers: $\beta =$

0.12; t = 1.40; for suppliers: β = 0.08; t = 0.56) or attitude towards a cooperative for either crab fishers or suppliers (for fishers: β = -0.07; t = 1.05; for suppliers: β = 0.02; t = 0.16).

The results of H1 indicate that individual factors, such as skill, experience and involvement, positively influence crab fishers' perceptions regarding the benefits from a cooperative. This means that the more skilled, experienced and involved crab fishermen are more likely to perceive the benefits of a cooperative-based mud crab value chain. Individual factors, such as skill, experience and involvement, influence the ability of crab fishers to perceive the benefits from a cooperative. This finding is consistent with the existing literature that relates to the perception of an individual towards the adoption of an innovation. For example, Davis (1989) presented evidence in support of the importance of individual characteristics/differences in predicting the perceived benefits from the adoption of an innovation. Moreover, Xu and Quaddus (2012) pointed out that individual or end-user characteristics or differences are important factors in predicting the adoption of an innovation (i.e. a cooperative in this research context). On the other hand, the individual factors of the crab suppliers, such as their skill, experience and involvement, are not relevant to their adoption of the cooperative although they are the value chain's key stakeholder and will be affected by the introduction of the cooperative in the value chain. This is supported by Pomeroy et al. (2001) who argue that the benefits to be obtained from participation in a cooperative must be greater than the costs of such activities. The role of the crab suppliers in this research context is similar to this argument. Although suppliers are a key stakeholder of the mud crab value chain, the adoption of the cooperative is likely to yield more costs for them than benefits. The reason is that crab suppliers are the key beneficiary of the existing value chain: revising the value chain through a cooperative is likely to ruin their dominant role over the crab fishers. Hence, the more skilled and experienced the crab suppliers are in the crab business, the less they will feel attracted to a cooperative. Therefore, a non-significant relationship between the individual factors of the crab suppliers and the perceived benefits of a cooperative is justified in this context.

Under H2 (IF→PB) and H3 (IF→ATC), individual factors were not found to have any significant effect on perceived barriers and attitude towards a cooperative. In Chapter 5 'Hypotheses and Questionnaire Development', it was argued that individual factors, such as skill, experience and involvement, are likely to reduce the perceived barriers to adopting a cooperative. Dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among existing channel members are the key three barriers to adopting the proposed fishers' cooperative in the mud crab value chain. Individual factors, such as skill, experience and involvement, are likely to reduce the perceived barriers to adopting a cooperative. However, the barriers to adopting a cooperative are so commanding (and are already being experienced by the crab fishers) in the mud crab context that these barriers are likely to outweigh the hypothetical perceived benefits from a cooperative. This is in line with Damanpour and Schneider (2006) who mentioned that, if the perception of benefits derived from the cooperative outweighs the risks or barriers associated with its adoption, it is likely that the person will make a positive adoption decision. Again, these findings of H2 and H3 are contrary to those of Fini et al. (2012) and Kang et al. (2013) who found empirical evidence that individual factors, such as skill, experience and involvement, play a significant role in determining attitudes towards an object.

7.3.2 Discussion on Hypotheses regarding Channel Factors (CF)

Under H4 (CF→PBC), H5 (CF→PB) and H6 (CF→ATC), it was hypothesized that channel factors negatively influence the perceived benefits of the cooperative for crab fishers but not for crab suppliers. The results revealed that H4 (CF→PBC) is not supported. Channel factors were found to positively influence perceived benefits for both crab fishers ($\beta = 0.38$; $t = 4.14$) and suppliers ($\beta = 0.32$; $t = 3.47$). For H5 (CF→PB), this influence was found for crab fishers ($\beta = 0.51$; $t = 6.28$) and suppliers ($\beta = 0.59$; $t = 7.07$), and for H6 (CF→ATC), it was found ($\beta = -0.03$; $t = 0.39$) for crab fishers and ($\beta = 0.14$; $t = 1.28$) for suppliers.

The effects of channel factors on perceived benefits are contrary to what were earlier expected and described. Based on existing research and the field study, the researcher hypothesized that channel factors negatively influence the perceived benefits of a cooperative for crab fishers but not for crab suppliers. Considering that

channel factors were operationalized as a second-order formative construct comprising three components: supplier influence, horizontal competition and vertical conflict, the researcher examined the individual effect of each channel factor component on perceived benefits for both crab fishers and suppliers. This was reported in the data analysis chapter (Table 6.19; Figures 6.5 and 6.6), and was conducted to explore which channel factor component positively or negatively influenced perceived benefits, perceived barriers and attitude towards a cooperative separately for crab fishers and suppliers under H4a (CFSI→PBC), H4b (CFHC→PBC), H4c (CFVC→PBC), H5a (CFSI→PB), H5b (CFHC→PB), H5c (CFVC→PB), H6a (CFSI→ATC), H6b (CFHC→ATC) and H6c (CFVC→ATC).

Under H4a (CFSI→PBC), supplier influence was found to have a significant negative influence on perceived benefits (β = -0.22; *t* = 2.94) for crab fishers but not for crab suppliers (β = -0.12; *t* = 0.79). This means that H4a is supported. This is in line with one of the current research's key arguments that crab suppliers' strong influence over crab fishers is a key characteristic of the existing distribution channel which causes dominance over and suffering of the crab fishers, while helping crab suppliers to create and uphold their empires. This finding is in line with that of Pomeroy et al. (2001) who mentioned that the economic incentives of adopting a fishery co-management system are important to resource stakeholders, such as fish traders and suppliers, who are directly dependent on a steady supply of fish products for their livelihood. However, the influencing role of these suppliers comes under threat due to the introduction of a co-management system and, thus, may prohibit the achievement of economic incentives. Hence, the supplier influence is supposed to negatively influence the perceived benefits of a cooperative.

Under H5a (CFSI→PB) and H6a (CFSI→ATC), supplier influence was not found to have any significant influence on perceived barriers (for fishers: β = 0.12; *t* = 1.06; for suppliers: β = 0.24; *t* = 0.71) and attitude towards a cooperative (for fishers: β = -0.03; *t* = 0.53; for suppliers: β = 0.12; *t* = 0.15), respectively, for both crab fishers and suppliers. The researcher hypothesized that supplier influence will enhance (positively influence) the perceived barriers and negatively influence the attitude towards a cooperative for crab fishers, but not for crab suppliers. Although the result did not reveal any significant impact on perceived barriers and attitude

towards a cooperative, the direction of the effects is in line with what had been hypothesized. The direction of effects was hypothesized in this way as the existing mud crab channel suffers from scarce resources and conflict between channel members. This leads to the prevalence of exploitation (by crab suppliers) in the value chain which eventually enhances the perceived barriers to a cooperative and negatively influences the attitude towards it by the crab fishers. This is in line with Anderson and Narus (1990) who mentioned that channel factors are able to control or influence the decision variables of an associated channel member and their decision.

Under H4b (CFHC→PBC), H5b (CFHC→PB) and H6b (CFHC→ATC), the effects of the second channel factor component, that is, the effects of horizontal competition on perceived benefits, perceived barriers and attitude towards a cooperative were examined for both crab fishers and suppliers. Under H4b, horizontal competition was found to have a significant positive impact on perceived benefits for crab fishers ($\beta = 0.36$; $t = 4.86$) but not for crab suppliers ($\beta = -0.02$; $t = 0.16$). This is contrary to what was expected under H4 (channel factors will negatively influence the perceived benefits [PBC] of a cooperative for crab fishers). This means that H4b (CFHC→PBC) is supported only for the suppliers. Considering that crab fishers are marginalized and suffer from poverty, they compete with each other in order to sell their products to crab suppliers, with this being their key source of earnings. Thus, it is understood that, due to the currently prevailing internal competition and tendency to competitively sell to the same supplier, no one among the crab fisher folk appears to care for anyone else's benefit except his/her own. This, in turn, induces them to recognize the beneficial aspects of a cooperative where they could cooperate with each other for the benefit of their overall community, which is already evident from the existing suppliers' cooperative. This leads them to positive perceptions about the potential benefits of a cooperative. In addition, H5b and H6b were not found to be significant for either crab fishers (for H5b: $\beta = -0.27$; $t = 0.63$; for H6b: $\beta = -0.03$; $t = 0.32$) or suppliers (for H5b: $\beta = 0.14$; $t = 0.66$; for H6b: $\beta = -0.13$; $t = 1.79$). This means that horizontal competition does not influence perceived barriers and attitude towards a cooperative for either crab fishers or suppliers. The findings relating to horizontal competition are in line with those of Nielson et al. (2004) who mentioned that a

fishery co-management system is usually contested by all the relevant parties/stakeholders. They compete with each other to secure their own benefits while some may see the fishery co-management system as a system through which they will be excluded from reaping benefits/resources. The proposed cooperative-based value chain will enable the crab fishers to be united and to reap benefits instead of what they are currently doing, that is, competing with each other to sell their products to the crab suppliers. This is likely to result in positive perceptions about the benefits of a cooperative. On the other hand, suppliers are likely to judge a cooperative as a system in which they will need to sacrifice their current dominating role over the crab fishers, with this eventually leading them to not support the cooperative.

Under H4c (CFVC→PBC), H5c (CFVC→PB) and H6c (CFVC→ATC), the effects of vertical conflict were examined on perceived benefits, perceived barriers and attitude towards a cooperative, respectively. For crab fishers, vertical conflict was found to have a significant positive influence on the perceived benefits of (H4c: $\beta = 0.28$; $t = 3.16$) and perceived barriers (H5c: $\beta = 0.47$; $t = 2.02$) to a cooperative. Similar positive influences of vertical conflict on perceived benefits ($\beta = 0.41$; $t = 2.99$) and perceived barriers ($\beta = 0.46$; $t = 2.92$) were also found for crab suppliers. This means that H4c is supported neither for fishers nor for the suppliers; and H5c is supported only for the fishers. Both crab fishers and suppliers consider vertical conflict as a major concern which leads them to see the perceived beneficial aspects of the cooperative. This also leads them to think that vertical conflict is a key barrier to adopting a cooperative in the mud crab value chain, with this thinking common among both the crab fishers and suppliers. On the other hand, vertical conflict was not found to have any significant influence on the attitude towards a cooperative for either crab fishers or suppliers. This finding relating to vertical conflict is in line with that of Nielsen et al. (2004) who mentioned that conflict is inevitable in the case of fishery co-management, especially where multiple sources of authority are involved, which is the situation that is happening in the context of the mud crab sector. Hence, such conflict is likely to influence the perceptions of the benefits of and barriers to adopting a cooperative in the mud crab value chain. In addition, under H6c, vertical conflict was found to have no significant influence on the attitudes of the crab fishers ($\beta = -0.05$; $t = 0.69$) or of

the crab suppliers (β = 0.09; *t* = 0.66) towards the cooperative. This means that, although it was hypothesized that, due to vertical conflict, they would have an inherent positive attitude towards a cooperative, in reality, this was not the case for the crab fishers.

7.3.3 Discussion on Hypotheses regarding Perceived Benefits (PBC), Perceived Barriers (PB) and Attitude (ATC)

This study examines the relationships of perceived benefits and perceived barriers to the attitude towards adopting a cooperative under H7 and H8, respectively, for both crab fishers and crab suppliers. Perceived benefits of the cooperative were found to positively influence the attitude towards a cooperative for both crab fishers (β = 0.67; *t* = 8.56) and crab suppliers (β = 0.61; *t* = 6.43). Perceived benefits were found to have a significant positive effect on the attitude towards a cooperative for crab fishers as well as for crab suppliers, although it was hypothesized that this path would not be significant for suppliers. Thus, H7 is supported only for the fishers. On the other hand, perceived barriers to the cooperative were not found to have a significant influence on attitude towards a cooperative for either fishers (β = 0.06; *t* = 0.62) or suppliers (β = 0.07; *t* = 0.56). Considering that, under H8, a negative significant path is hypothesized for crab fishers but not for suppliers, H8 is supported only for the suppliers.

The above findings regarding the relationship of perceived benefits and perceived barriers to the attitude towards adopting a cooperative are in line with the existing literature and adoption-diffusion theory. For example, based on the diffusion of innovation (DoI) theory (Rogers, 1995), Quaddus and Hofmeyer (2007) mentioned that the decision to adopt an innovation is influenced by its attributes, such as the perceived benefits of that innovation. Thus, it is likely that the decision to adopt a cooperative in the existing mud crab value chain is influenced by the perceived benefits of the cooperative and the crab fishers' attitude towards a cooperative. The construct 'perceived benefits' was operationalized based on three key benefits: generating alternative income, more income and compatibility with the existing distribution system. As the proposed cooperative will involve all the crab fishers together, they will have the bargaining capacity to receive a fair and higher price for their crab catches which is likely to ensure higher

income for them. In addition, the proposed cooperative is likely to perform other relevant crab business activities, such as grading, packaging, storing, etc., with this work to be done by the crab fishers' family members; hence, the cooperative is also likely to increase the alternative income of the crab fishers' households. In addition, a new cooperative-based mud crab value chain may be perceived as compatible with the crab fishers' existing values and past experiences and, thus, may contribute to generating positive attitudes towards the cooperative. Interestingly, the positive effects of perceived benefits on attitude were significant for both crab fishers and suppliers. It is quite intuitive that the crab fishers will appreciate the benefits of the cooperative and, thus, will possess a positive attitude towards it. On the other hand, although the cooperative is likely to demolish the crab suppliers' empires and/or dominance over the crab fishers, the study findings show evidence that the crab suppliers realize that the cooperative will deliver certain benefits to the crab fishers.

On the other hand, perceived barriers were not found to have any significant influence on attitude towards a cooperative for either crab fishers or suppliers. Although the researcher was expecting to find a negative effect for crab fishers of perceived barriers on attitude towards a cooperative, a non-significant path between the two constructs was in line with the researcher's expectation. The study's findings show that the three key barriers to adopting a cooperative in the mud crab value chain are the dishonesty of the leaders, and the lack of trust and lack of unity among the channel members. While the existing research (e.g. Morgan & Hunt, 1994; Coote et al., 2003) has reported the lack of trust and lack of unity among existing mud crab value chain members, these three key barriers are likely to hinder the crab fishers' attitudes towards adopting the cooperative in the existing mud crab value chain. Thus, the findings of the current study are in line with Littler and Melanthiou (2006) who mentioned that perceived barriers connote the perception of the uncertainty and possible undesirable consequences of adopting a cooperative in the mud crab value chain.

7.3.4 Discussion on Hypotheses regarding Social Influence (SI), Attitude (ATC) and Intention (INC)

The relationships between: (i) social influence and attitude towards a cooperative; and (ii) social influence and intention to be engaged with a cooperative were

examined for both crab fishers and crab suppliers under H9 and H10, respectively. Social influence was found to have no significant influence on either crab fishers' or crab suppliers' attitudes towards a cooperative (for fishers: β = - 0.05; t = 0.95; for suppliers: β = 0.08; t = 0.84) nor on the intention to be engaged with a cooperative (for fishers: β = 0.03; t = 0.59; for suppliers: β = 0.27; t = 1.26). This means that both H9 and H10 are supported only for the suppliers (not for the fishers) as it was hypothesized that these paths would not be significant for crab suppliers. Although these findings were not expected by the researcher, they are acceptable as they show that family influence and peer influence do not have any role to play in having a positive attitude towards, or intention to be engaged with, a cooperative. This is intuitive in the prevailing situation of the crab fishers especially with the lack of trust and horizontal competition between them: this situation forms the background in support of the view that peer influence does not have a significant role in whether they have a positive attitude towards, or intention to be engaged with, a cooperative. On the other hand, another key characteristic of crab fishers in rural Bangladesh is illiteracy and male domination (i.e. husband) over the female (i.e. wife) family member (Sultana, 2012). Hence, the decision whether to be engaged with a cooperative is usually dependent on the male crab fishers (i.e. the husbands), with their decisions less likely to be influenced by their wives.

7.3.5 Discussion on Hypotheses regarding Situational Factors (SF), Attitude (ATC) and Intention (INC)

As with social influence, the relationships between (i) situational factors and attitude towards a cooperative; and (ii) situational factors and intention to be engaged with a cooperative were examined for both crab fishers and crab suppliers under H11 and H12, respectively. Situational factors were found to have no significant influence on attitude towards a cooperative for either crab fishers (β = 0.16; t = 1.72) or suppliers (β = 0.14; t = 1.67). On the other hand, situational factors were found to significantly influence the intention to be engaged with a cooperative for crab fishers (β = 0.38; t = 4.41) but not for crab suppliers (β = 0.16; t = 1.19). Hence, H11 is found to be supported only for the suppliers but not for fishers; while H12 is supported. This means that, although situational factors such as the government and NGOs, do not play a significant role in generating a positive attitude towards a cooperative for either crab fishers or suppliers, the government

and NGOs play a significant role in crab fishers' intention to be engaged with the proposed new cooperative-based crab value chain.

The above findings are supported by the existing literature. For example, Pomeroy et al. (2001) mentioned that government administrators, planners and policy makers support co-management in the rural fishery sector for reducing conflicts and streamlining plans and policies. As indicated by Pavlou and Fygenson (2006), support from the government and NGOs is likely to help the existing crab channel members to more easily perceive the crab fishers' cooperative and will help the crab fishers deal with the difficulties relating to the adoption of a cooperative. The role of the Bangladesh government is also crucial as the government can intervene in the existing crab distribution system with funding schemes and management policies aimed at mitigating market inefficiencies and outperforming the negative role of crab suppliers (Fini et al., 2012). Furthermore, the active positive role of NGOs in managing fishery co-management is well supported by other studies in the literature, such as Nielsen et al. (2004). In addition, both the government and NGOs could play an instrumental role in developing the required skills among the crab fishers by offering them the necessary training.

7.3.6 Discussion on Hypothesis regarding Attitude (ATC) and Intention (INC)

The effect of the attitude towards a cooperative on the intention to be engaged with a cooperative was examined under H13. It was expected that the path between attitude towards and intention to be engaged with a cooperative would be significant for the crab fishers but not for the crab suppliers. The attitude was found to significantly influence the intention for both crab fishers ($\beta = 0.29$; $t = 3.67$) and crab suppliers ($\beta = 0.30$; $t = 2.12$). Hence, H13 is supported only for the fishers but not for the suppliers. This link between attitude and intention is quite intuitive and is expected for the crab fishers, given their prevailing situation. The result is supported by the theory of planned behaviour (TPB) (Ajzen, 1985). Moreover, the existing research has highlighted that an individual's favourable or unfavourable attitude towards an innovation influences his/her intention to adopt prior to making an actual adoption decision (e.g. Rogers, 1983; Thong & Yap, 1995). Interestingly, the finding shows that the path between attitude towards, and intention to be engaged with, a cooperative is also supported for the crab suppliers. Although the

field study found that crab suppliers may be less likely to support a cooperative in the existing mud crab value chain due to fear of the loss of their control over the crab fishers, the data analysis for H7 shows that the perceived benefits of a cooperative positively influence their attitude towards a cooperative. Consequently, it was also found that the attitude of the crab suppliers influences their intention to be engaged with a cooperative under H13. This means that, despite the current dominant role of the crab suppliers over the crab fishers, the crab suppliers have not ignored the positive benefits of establishing a cooperative in the existing mud crab value chain which could be helpful for the crab fishers.

7.3.7 Discussion on Hypothesis regarding Intention (INC) and Perceived Sustainable Livelihood (PSL)

The effect of the intention to be engaged with a cooperative on perceived sustainable livelihood was examined under H14. It was expected that this path would be significant for the crab fishers but not for the crab suppliers. The path between the intention to engaged with a cooperative and a perceived sustainable livelihood was found to be significant for both crab fishers ($\beta = 0.62$; $t = 9.08$) and suppliers ($\beta = 0.49$; $t = 5.65$). Hence, H14 is supported only for the fishers. This means that both the crab fishers and suppliers held the view that the crab fishers' sustainable livelihood could be achieved if they became engaged with the proposed cooperative-based mud crab value chain. This is supported by the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980) through which the predictive behaviour, after adopting the crab fishers' cooperative, is perceived to be a sustainable livelihood which is influenced by the intention of the channel members, that is, the crab fishers and suppliers. In addition, this role of the cooperative in enhancing the perceived sustainable livelihood of the crab fishers is supported by the existing literature (e.g. Van de Fliert et al., 2002; Gurung et al., 2005) in which it is mentioned that the participatory co-management approach can overcome relevant obstacles (e.g. unfavourable economic and social power) faced by the rural fishers in their attempt to ensure a better livelihood.

7.3.8 Discussion on Hypothesis regarding the Mediating Role of Perceived Benefits (PBC) on the Relationship between Individual Factors (IF) and Attitude (ATC)

In the current study, the researcher examined the mediating role of perceived benefits in the relationship between individual factors and the attitude towards a cooperative for crab fishers under H15, using Baron and Kenny' (1986) four-step method. It was found that H15 is supported, as perceived benefits fully mediate the relationship between individual factors and attitude towards a cooperative. The direct effects (β = -0.04; t= 0.61) of individual factors on attitude in the presence of perceived benefits is not significant, whereas the indirect effect (β = 0.27; t =4.41) of individual factors on attitude is significant (see Table 6.19 in Chapter 6). This means that individual factors, such as skill, experience and involvement, contribute to generating a positive attitude towards a cooperative only if the benefits of the cooperative are perceived by the crab fishers. This makes sense as the attitude or belief towards an object grows if that object offers any benefits or overcomes any barriers. This is supported by the existing literature which suggests that entrepreneurs' individual factors, such as skill and personal abilities, influence attitudes directly and entrepreneurial intentions indirectly (Fini et al., 2012; Damanpour & Schneider, 2006). The mediating role of perceived benefits in the relationship between individual factors and attitude towards a cooperative means that the benefits of a cooperative (e.g. more income, alternative income and compatibility), as pointed out in the current research, are the key to attracting crab fishers to the cooperative. Furthermore, crab fishers' skill, involvement and experience in fishing are the key factors that help them to perceive the benefits of a cooperative and thus help them to have a positive attitude towards a cooperative.

7.3.9 Discussion on Hypotheses regarding Mediating Role of Perceived Benefits (PBC) on the link of Channel Factors (CF) and Attitude (ATC)

The mediating role of perceived benefits on the relationship between channel factors and the attitude towards a cooperative was examined in this study. Specifically, as the effects of each channel factor component, that is, supplier influence, horizontal competition and vertical conflict, was tested on perceived benefits and attitude, the mediating role of perceived benefits was also examined in

the relationships of supplier influence, horizontal competition and vertical conflict with the attitude towards a cooperative under H16a, H16b and H16c. Under H16a, perceived benefits were not found to be significant for the crab fishers in meeting any conditions for mediation in the relationship between supplier influence and attitude towards a cooperative, resulting in the mediation effect of perceived benefits being absent. Hence, H16a is not supported. Under H16b, the mediating role of perceived benefits was tested for the crab fishers in the relationship between horizontal competition and attitude towards a cooperative. For the crab fishers, perceived benefits were found to fully mediate the relationship between horizontal competition and attitude towards a cooperative.

The direct effect (β = -0.07; t= 1.13) of horizontal competition on attitude towards a cooperative was found to be insignificant in the presence of perceived benefits for the crab fishers, whereas the indirect effect (β = 0.21; t =3.74) of horizontal competition was found to be significant. Hence, H16b is supported. This means that crab fishers are likely to perceive higher benefits from having a cooperative in the existing crab value chain due to the existence of competition with their fellow fishers. In the same way, the mediating role of perceived benefits was tested for the crab fishers in the relationship between vertical conflict and attitude towards a cooperative under H16c. H16c was not supported; that is, perceived benefits did not mediate the relationship for crab fishers between vertical conflict and attitude towards a cooperative.

7.3.10 Discussion on Hypotheses regarding Mediating Role of Perceived Barriers (PB) on Relationship between Channel Factors (CF) and Attitude (ATC)

The mediating role of perceived barriers on the relationship between channel factors and the attitude towards a cooperative was examined in the current study. As previously mentioned, the mediating role of perceived barriers was examined on the relationships of each channel factor component (i.e. supplier influence, horizontal competition and vertical conflict) with the attitude towards a cooperative under H17a, H17b and H17c. Under H17a, perceived barriers were not found to mediate the relationship between supplier influence and attitude towards a cooperative as one of the key conditions of mediation, the effects of supplier

influence, was not found to be significant on attitude. H17b was also found to be not supported. Both the direct effect (β = 0.10; *t* = 0.65) and indirect effect (β = 0.06; *t* = 0.51) of horizontal competition on the attitude towards a cooperative were found to be insignificant in the presence of perceived barriers. Under H17c, both the direct effect (β = 0.02; *t*= 0.17) and indirect effect (β = 0.12; *t* = 1.64) of vertical conflict on attitude towards a cooperative were found to be insignificant under 5% level of significance (LOS) but, at 10% LOS, the indirect path is significant. Therefore, it can be said that the path between vertical conflict and attitude towards a cooperative is fully mediated, at 10% LOS, by perceived barriers. Notably, vertical conflict was found to have a significant positive influence on perceived barriers. Again, the direction of both the direct effect and indirect (via perceived barriers) effect on attitude towards a cooperative is also positive. Hence, it can be said that, due to vertical conflict with crab suppliers, the crab fishers are more inclined to perceive barriers to adopting a cooperative although their attitude towards a cooperative remains high and positive. This indicates that the crab fishers really wish to eradicate conflict from their environment, as well as removing the dominance of the crab suppliers.

7.3.11 Discussion on Hypothesis regarding Mediating Role of Attitude (ATC) on the Link between Social Influence (SI) and Intention (INC)

Under H18, the mediating role of attitude towards a cooperative was examined in the relationship between social influential factors and the intention to be engaged with a cooperative. Both the direct effect (β = 0.11; *t* = 2.25) and indirect effect (β = 0.05; *t* = 1.49) of social influential factors on the intention to be engaged with a cooperative were found to not be significant. Hence, attitude towards a cooperative does not mediate the link between social influential factors and the intention to be engaged with a cooperative. This means that although social influence separately influences the attitude towards, and the intention to be engaged with, a cooperative for the crab fishers, this effect is not reached through their attitude. Past literature expressed a similar view when they focused on the role of the external agent, such as family and peers initiate a process of discovery, social learning, guide problem solving, build local capabilities and advocate appropriate policies with regard to co-management in the fishery sector (Pomeroy et al., 2001).

7.3.12 Discussion on Hypothesis about Mediating Role of Attitude (ATC) on the Link between Situational Factors (SF) and Intention (INC)

Under H19, the mediating role of attitude towards a cooperative was examined in the relationship between situational factors and intention to be engaged with a cooperative. It has been found that both the direct effect ($\beta = 0.39$; $t = 4.51$) and indirect effect ($\beta = 0.13$; $t = 3.12$) of situational factors on intention to be engaged with a cooperative were found to be significant. Hence, attitude towards a cooperative partially mediates the link between situational factors and intention to be engaged with a cooperative. This means that both the government and NGOs have a major role to play in this regard by helping the crab fishers in their adoption of a cooperative in the mud crab value chain. This view is also supported by Pomeroy et al. (2001) who mentioned that the role of the external agent such as the government or an NGO involves initiating a process of discovery, social learning, guiding problem solving, building local capabilities and advocating appropriate policies with regard to co-management in the fishery sector.

7.4 SUMMARY

This chapter discussed the results of the qualitative and quantitative data analyses which were presented corresponding to the respective objectives and hypotheses of the study. In the following chapter (Chapter 8), the summary of the thesis and a detailed discussion on the theoretical, practical and methodological contributions of the study have been outlined.

CHAPTER 8

CONCLUSION

8.0 INTRODUCTION

This chapter concludes the thesis. It presents a brief summary that covers the research problem, along with an overview of all eight chapters. The key theoretical, practical and methodological contributions of the study are also outlined in this chapter. Finally, the chapter discusses the challenges faced by the researcher, the limitations of the study and the directions for future research.

8.1 SUMMARY OF THE THESIS

In the given context of the current long, cumbersome and manipulative mud crab value chain that threatens the livelihood of mud crab fishers, the key research problem investigated by this study is how to make the livelihood of coastal crab fishers sustainable. In attempting to discover ways to make the current mud crab value chain shorter in length and beneficial for the crab fishers, the review of the current literature found that prior studies emphasized two primary strategies: vertical integration and introducing a cooperative. Although vertical integration and introducing a cooperative are proven ways of improving an existing value chain, neither vertical integration nor the introduction of a cooperative has been assessed in the mud crab sector of Bangladesh. Based on the pros and cons and past success stories of vertical integration and establishing a cooperative, this thesis considers that establishing a cooperative is the ideal remedy for the current research problem. A cooperative would encompass vertical integration of channel levels as well as being able to be operated based on membership and the principles of cooperation instead of those of competition. This would be likely to ensure a fair price for the crab fishers and would break the exploitation trap that they currently experience. Considering that the existing mud crab value chain threatens the livelihood of mud crab fishers and causes a social problem in the rural coastal areas of Bangladesh, this research has borrowed the concept of the social business model to develop an improved mud crab value chain to ensure a sustainable livelihood for the crab fishers. Therefore, this study posits that introducing a cooperative into the mud crab value chain in Bangladesh would be aimed at enhancing the marginalized crab

fishers' livelihood by integrating existing value chain participants under one umbrella. However, before introducing a cooperative in the mud crab value chain, it is of utmost importance to explore whether the crab fishers and other value chain participants are willing to adopt the new cooperative-based mud crab value chain. It is also necessary to decide which channel levels need to be integrated under the umbrella of the cooperative, and whether introducing a fishers' cooperative would actually contribute to the crab fishers attaining a sustainable livelihood. Based on these pertinent issues, the statement of the fundamental research problem investigated by this study is "Enhancing the Sustainable Livelihood of Crab Fishers: A Study of the Mud Crab Value Chain of Coastal Bangladesh Using the Social Business Model".

Consequently, this study addressed three research questions and four research objectives. The research questions are: (a) what are the effects of the existing mud crab value chain on the sustainable livelihood of crab fishers in coastal Bangladesh? (b) how can the social business model be used to develop an improved mud crab value chain to enrich the livelihood of crab fishers? and (c) is the cooperative-based improved value chain acceptable to the various stakeholders of the mud crab industry? The research objectives corresponding to the above research questions are: (i) to investigate the impact of the existing mud crab value chain on the livelihood of channel members with a special focus on the livelihood of crab fishers; (ii) to explore how the social business model can be used to develop an improved mud crab value chain; (iii) to identify the factors that influence the acceptability of the new mud crab value chain by value chain participants with a special focus on crab fishers; (iv) to examine the effects of adopting the mud crab value chain on the livelihood of crab fishers.

The study was conducted following a mixed-methods approach (a qualitative field study followed by a quantitative survey). This thesis contains eight chapters in total. Chapter 1 focused on the background to the study and identified the research problem as derived from different research gaps in the existing literature. Following this, the research questions and objectives to be addressed in the study were outlined. The definition of different terms used in the thesis, the schematic view of the thesis, research methodology and research significance from theoretical, practical and methodological points of view were discussed. Chapter 2

contained an exhaustive literature review conducted on different issues relating to the mud crab sector of Bangladesh, that is, value chain analysis, cooperatives, vertical integration, the social business and a sustainable livelihood. The chapter's introduction was followed by a brief overview of the mud crab sector from the world view as well as from the Bangladesh context. The chapter then discussed the relevant literature on: value chain analysis; mud crab value chain analysis from the Bangladesh perspective; revision of the existing value chain using vertical integration and the introduction of a cooperative; and a sustainable livelihood. Furthermore, the chapter outlined the relevant theories of the study, namely, the social business model and the theory of planned behaviour (TPB). While discussing the literature and these theories, the researcher outlined the relevant research gap and finally derived an initial conceptual framework to assess in the subsequent chapters. Chapter 3 discussed the research methodology in detail. The chapter outlined the mixed-methods research design covering a two-stage research process: a qualitative field study to revise and enhance the conceptual framework developed from the literature review chapter and a quantitative survey conducted to test the research hypotheses. The qualitative field study also developed a survey instrument that was used in the quantitative approach. In this chapter, the paradigm of the mixed methodology approach is first described, and the method of conducting the qualitative and quantitative stages of the research is then outlined.

Chapter 4 presented the field study and the development of the final research model. The details of the process used to conduct the field study were described and the results of the qualitative data analyses were outlined. The chapter highlighted the rationale for conducting the field study using the group interview method, and presented the following: a brief sample profile for the field study, the data analysis process in terms of coding (deductive) and the themes (under thematic analysis), and concluding with a broad discussion of the factors and variables identified during the interviews. The chapter also illustrated the final study model, incorporating the field study results and the factors identified from the literature review. In Chapter 5, the hypotheses developed for the study and the development of the questionnaire to be used in conducting the survey were outlined. The systematic formulation of each hypothesis involved using adequate support from the existing literature and the relevant theories, and was contextualised using the

field study findings. Following the section on hypotheses development, the development procedures were outlined for the two separate questionnaires (one for crab fishers and the other for crab suppliers) the measures of the constructs and their respective sources. In addition, the chapter presented a brief description of the pre-testing of the survey instrument. Chapter 6 contained the analysis of the quantitative data. It presented analyses of the quantitative data in detail, including the rationale for the sample size; assessment of non-response bias; assessment of common method bias; justification of formative and reflective constructs; the measurement model estimation; assessment of the psychometric properties of the constructs used in the model, followed by the structural model estimation. In Chapter 7, detailed discussions of the insights derived from the results of both qualitative and quantitative data analyses were discussed. This included discussion on how the four research objectives outlined in Chapter 1 were addressed. The chapter further discussed each hypothesis in terms of its comparison and contrast with the existing research. This chapter provided the theoretical, practical and methodological implications of the results. Finally, Chapter 8 outlines the conclusion and the future research directions of the research. This final chapter provides an overview of the study, discusses its limitations and presents a brief discussion of possible future research directions relevant to the subject area of the study.

8.2 CONTRIBUTIONS OF THE STUDY

8.2.1 Theoretical Contributions

This study contributes to the existing literature in the following ways:

- First, this research extends the social business concept and demonstrates its application in the context of the mud crab value chain. It views a cooperative as a social business entity and shows that a cooperative guided by the social business concept can enhance the sustainable livelihood of the mud crab fishers.

- Second, the study presents evidence supporting the fact that the existing mud crab value chain negatively influences the livelihood system of the mud crab fishers, whereas the crab suppliers are the primary beneficiaries of the current crab distribution system from coastal Bangladesh.

- Third, the study offers relevant insights relating to the introduction of a new cooperative-based mud crab value chain. In doing so, the study assesses the feasibility of adopting a cooperative in the mud crab value chain.

- Fourth, guided by the social business concept (Yunus, 2009), this study proposes a behavioural model that is focused on the factors that influence the adoption of a cooperative by the existing channel members. No prior study has explored the factors influencing the likelihood of adopting a cooperative in Bangladesh. In doing so, the study identifies several factors (e.g. individual factors, channel factors, perceived benefits, perceived barriers, social influence and situational factors) that would influence the adoption of the proposed cooperative-based mud crab value chain.

- Fifth, the survey findings relating to factors that influence the adoption of a cooperative offer interesting insights that extend existing knowledge in the literature on the social business and cooperatives. For example, individual factors, such as skill, experience and involvement, have significant positive direct effects on the perceived benefits of a cooperative as well as having indirect effects (via perceived benefits) on the attitude towards a cooperative. Notably, perceived benefits were found to fully mediate the relationship between individual factors and the attitude towards a cooperative. This is a significant theoretical contribution which extends the social business concept by presenting empirical evidence in support of the underlying cognitive mechanism that individuals' existing knowledge, skills and experiences influence their attitudes towards the social business entity (i.e. a mud crab fishers' cooperative), and that this influence is fully mediated by the benefits that a cooperative is likely to offer. This means that for social business entities to be acceptable, they should offer specific benefits relevant to the targeted group of individuals.

- Sixth, the effects of the different channel factor components: supplier influence, horizontal competition and vertical conflict, offer useful insights that extend the existing literature on cooperatives and their adoption. For example, the crab supplier influence, as a channel factor, negatively influences the perceived benefits of a cooperative for crab fishers, whereas horizontal competition and vertical conflict positively influence the perceived benefits of a cooperative for

crab fishers. These findings are insightful as they reinforce the fact that the crab suppliers are immensely influential over the crab fishers and make them psychologically unable to consider any alternative option for selling their crab produce to anyone other than the crab suppliers. Thus, the crab fishers cannot even perceive the beneficial aspects of a cooperative. On the other hand, the effects of horizontal competition and vertical conflict are found to have a significant positive impact on the perceived benefits of a cooperative. This indicates that, due to competition between the crab fishers and conflict with the crab suppliers, the crab fishers are eager to know about the benefits of alternative options, such as a cooperative.

- Seventh, the identification of the key benefits (more income, alternative income and compatibility) and barriers (dishonesty of the leaders of the cooperative, and lack of trust and lack of unity among channel members) to adopting a cooperative for the crab fishers are useful insights for academics as well as practitioners.

- Eighth, the finding that perceived benefits mediate the relationship between horizontal competition (as a channel factor) and the attitude towards a cooperative indicates that crab fishers possess an inherently positive attitude towards a cooperative as an alternative option to the existing value chain in which they compete with each other.

- Ninth, the study has also been found that perceived barriers mediate the relationship between vertical conflict (as a channel factor) and the attitude towards a cooperative. This is an interesting finding as it shows that vertical conflict between crab fishers and crab suppliers are so significant that the conflict induces the fishers' perception of barriers to adopting a cooperative, with this eventually contributing to the crab fishers having a positive attitude towards a cooperative as an alternative to the existing crab distribution system.

- Tenth, the findings of significant path relationships of: (i) the attitude towards, and the intention to be engaged with, a cooperative; and (ii) the situational factors involved in the attitude towards, and the intention to be engaged with, a cooperative extend the existing theory of planned behaviour (TPB) literature by

showing empirical evidence in support of this theory in the cooperative and/or social business context.

- Finally, this research presents empirical evidence that a cooperative-based mud crab value chain can enhance the perceived sustainable livelihood of the crab fishers, thus indicating key policy implications for the government and NGOs, as outlined in the following section.

8.2.2 Practical Implications

From the practical perspective, the findings of the research offer a better understanding of the drawbacks of the existing mud crab value chain and indicate the need to revise the existing value chain to ensure a sustainable livelihood for the crab fishers. The factors that were found to influence the adoption of a new cooperative-based mud crab value chain will also help national policy makers and existing crab fishing channel members by providing effective guidelines for successfully introducing a cooperative within the crab business.

Establishing a new cooperative-based mud crab value chain requires cooperation and support from all the value chain members as well as from the government and NGOs operating in the respective rural areas. The role of the government in launching a cooperative is crucial as the government is often associated with enabling policies and legislation; the arbitration of disputes among partners when these cannot be resolved by the parties themselves; provision of financial and technical assistance to sustain cooperative activities; and the promotion of a stable political and social environment (Pomeroy et al., 2001).

On the other hand, the role of external agencies, such as local NGOs, is also critical as this role involves initiating a process of social learning, guiding problem solving, building local capabilities and advocating appropriate policies. Considering that local poor people have more access to NGOs than to government officials, NGOs can play an active role in creating awareness about a cooperative and educating the local people about its governing principles.

In addition, both the government and NGOs could help to ensure support in catalysing collective action, providing information, building capacity, and

providing technical assistance and market support (Paumgarten et al., 2012). These interventions are especially useful given the formality required, mainly by the export markets. Moreover, the government should take steps to make market information more accessible through the development of appropriate information and communications technologies (ICTs) (e.g. SMS [Short Message Service]); offering training to enhance the skill sets of the crab fishers; and designing effective and efficient microfinance institutions in rural coastal Bangladesh that can offer easy loans to the crab fishers at an affordable interest rate. This will also rescue the crab fishers from loan sharks. Notably, most of these loan sharks are local crab suppliers; hence, it is likely that they possess a negative attitude towards the establishment of a fishers' cooperative which is likely to challenge their current money-making business.

As is evident from the earlier discussion, existing value chain members suffer from the lack of trust and unity and a conflict situation is present between the crab fishers and crab suppliers. However, to make a cooperative successful, it is of immense importance to develop and promote trust between the partners through effective communication and even through contractual agreements (Pomeroy et al., 2001), if necessary.

Another key barrier to the cooperative, as identified in Chapter 4, is dishonesty of the leaders of the cooperative. This emphasizes the need to ensure smooth management of the cooperative in a democratic way in which the leaders are elected for a certain time. In addition, the accountability of the cooperative leaders, the unity of the members, proper financial management of the cooperative's funds and smooth functioning of relevant other activities need to be ensured.

Considering that the crab suppliers may not be in favour of establishing a cooperative as it will ruin their dominance over the crab fishers, the government and NGOs should undertake strategies, such as a counselling service or educating the suppliers which may also ensure benefits to them in the long run. If these types of motivating positive strategies do not work, then government agencies should enforce legal steps to ensure the smooth functioning of the cooperative.

8.2.3 Methodological Contributions

In addition to the above-mentioned theoretical and practical implications, this research also offers significant methodological contributions. Although the study used existing scale items to measure its constructs, the measures used in this study are contextually driven; hence, they can be used by future researchers who intend to work in the broad area of the adoption of a cooperative. Specifically, the measures of perceived benefits of and perceived barriers to a cooperative reflect the usual scenario in developing countries. In addition, the measures of individual factors, channel factors, attitude, intention and perceived sustainable livelihood are also theoretically driven and contextually modified; hence, they provide directions for future research in this area.

Therefore, this study has not only extended the current body of knowledge on the value chain and the cooperative, in general, but also offers significant policy implications.

8.3 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

As with any other research, this study suffered from some limitations. Furthermore, due to the nature and context of the study, the researcher experienced some challenges while collecting data. These limitations and challenges are outlined below, but could also be considered as areas for future research.

Firstly, the sample of respondents for the in-depth group interviews and survey were selected based on convenience sampling. With the respondents selected from the same demographic group, future research may consider selecting respondents at random.

Secondly, both the in-depth group interviews and survey were conducted with the primary value chain members, namely, crab fishers and crab suppliers or aratders. However, other members in the value chain, such as crab collectors, depot owners and exporters' agents, were not interviewed or surveyed in this research as crab collectors may not be present in all rural locations, and as some crab suppliers may also own their own depots for storing the crabs. Hence, future research may consider surveying these groups from the crab value chain in case they possess different opinions to what has been reported in this thesis.

Thirdly, the core research problem of this study is to address enhancing the sustainable livelihood of crab fishers. However, the nature of the collected data is attitudinal and the 'perceived sustainable livelihood' is the ultimate outcome variable of the study. Although existing marketing theories (e.g. Fishbein & Ajzen, 1975) suggest that attitude leads to behaviour, obtaining a sustainable livelihood for crab fishers in real time may involve more complex situations that what is considered in this study. Future research could consider collecting real-time data in order to test the model suggested in this study.

Fourthly, although the benefits of and barriers to the cooperative considered by the researcher in this study are driven from the field study and the relevant literature, these are more perceptual in nature rather than actual phenomena. Hence, future research should test the model developed in this research in a real-time cooperative context, thus, examining whether introducing a social business-based cooperative could ensure a sustainable livelihood for crab fishers.

Fifthly, this research emphasizes revising the existing mud crab value chain by establishing a cooperative in order to enhance the sustainable livelihood of the crab fishers of Bangladesh. Future research may consider other relevant strategies, such as vertical integration, direct marketing, etc. to enhance the sustainability of the livelihood of the crab fishers.

Finally, as the study is focused on remote rural people who are mostly illiterate, the researcher faced challenges talking to them and gaining their understanding about the relevant issues of the study. To overcome this challenge, the researcher took her time and patiently approached respondents multiple times. In addition, due to political turmoil, the researcher faced difficulties visiting the coastal sites at her desired time and convenience. To address this challenge, the researcher spent more time on data collection than what she had initially planned.

The above directions for future research have been made possible by the current study's findings which have moved forward the body of knowledge about the sustainable livelihood through a cooperative based value chain in general, and the mud crab fishers of coastal Bangladesh, in particular.

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APPENDICES

Appendix 4.1: In Depth Interview Schedule

Name: …….. Age: …… Gender: Male / Female

Function /profession: _____

Location: _____

Area: _____

General Questions:

Q1**:** Please describe your profession (what are your everyday usual activities?)

Q2**:** Please describe how the crabs are distributed and marketed from coastal areas?

Q3**:** What is your perception about the impact of existing marketing system on crab fishers?

Q4**:** Please describe how the following factors affect your profession**:**

- Shocks (flood , cyclone, Illness, Environmental change. degradation)
- Trends (Population increase; Political turmoil, etc.)
- Seasonality
- Dadon system

Individual Factors:

Q5. Please describe your key roles, responsibilities, and nature of involvement in the crab business.

Q6. Please tell us about the knowledge and skill that you require for your profession?

Q7: How long have you been involved with this profession i.e. your experience?

Channel Factors:

Q8: Please tell us about the nature and the extent of communication that you usually have with other channel members involved in crab sector.

Q9: To what extent the channel members are cooperative to each other? Please describe.

Q10: Do you think that the channel members will feel that there is a necessity to bring a change in the existing system and/or marketing chain of the crab business?

Cooperative (in general):

Q11: Are you aware of cooperative? Do you think that establishment of a cooperative in the existing crab marketing chain will be useful?

Perceived Benefits of Adopting Cooperative:

Q12: What would encourage you to consider adoption of a cooperative for marketing and distribution of crab?

- What are the benefits of a cooperative in general, for example, relative advantage, generating consistent income, compatibility, etc.?

- What are the benefits of a cooperative to you? (How can cooperative help you to perform your job better?)

Perceived Barriers of Adopting Cooperative:

Q13: What would bother / disturb you to consider adoption of a cooperative for marketing and distribution of crab?

- What are the barriers of a cooperative (such as sacrifice, risk, resistance) that would make you feel difficult to adopt a cooperative?

Social Influence:

Q14: Are your family members broadly involved with this profession / in this sector?

Q15: How likely your family members and other channel members will influence you to adopt cooperative?

Q16: Do you think that existing influential middlemen such as aratders, depot owners, etc. will influence the likelihood of adopting a cooperative? How?

Situational Factors:

Q17: Do you think existing channel members' previous experience about cooperative will influence their intention to adopt cooperative? How?

Q18: Do you think existing channel members' self-efficacy / confidence about cooperative will influence their intention to adopt cooperative? How?

Q19: What do you think the Govt. and NGOs can do in establishing a cooperative in the mud-crab marketing chain?

Perceived expected performance:

Q20: What do you think about the possible impact of establishing a cooperative on the crab fishers' livelihood? Please describe.

Please describes your social, economic and environmental conditions.

i) Social capital:
   - Network
   - Cultural norm
   - Share of knowledge
   - cooperation

ii) Natural capital:
   - Access to land
   - Water
   - Environment

iii) Economic/Financial capital:
   - Income
   - Savings
   - Loan access

iv) Physical capital :
   - Sanitary
   - Transport
   - Health

v) Human capital :
   - Skill
   - Knowledge

Q3. Please describe how your profession are and daily life is affected by the following factors:

- Shocks (flood , cyclone, Illness, Environmental change. degradation):
- Trends (Population increase; Political turmoil, etc.):
- Seasonality:

Q4. Do you feel that you are not getting the actual market price? If no, why and what do you think is the remedy?

Q5. Do you think you are exploited by the other channel members? If yes, how and why?

Q6. Have you ever take Dadon from the Aratders or middlemen's? How it works? And how you return back this loan?

Q7. Are you aware of cooperative? Could you please describe what do you know about cooperative?

Q8. Do you think establishment of a cooperative will be beneficial / helpful for you? Why and how?

Probe if necessary:

- Benefits
- Drawbacks

Q9. Do you think Gov't help is necessary to establish a cooperative for your betterment? How?

Q10. Do you think NGOs help is necessary to establish a cooperative for your betterment? How?

Social Business Focused Questions:

General Questions:

Q1: Please describe how the crabs are distributed and marketed from coastal areas?

Q2: Please describe the key drawbacks of the existing mud-crab value chain.

Social Business Lesson 1:

Q3: Do you think existing crab distribution and marketing system needs to be changed? Please describe why and how?

Q4: Are you aware of cooperative? Do you think establishing a cooperative in the value chain will be useful for all the value chain members especially for crab fishers? How?

Q5: What is your perception about the difference between a cooperative and a conventional profit oriented organization?

Q6: What will be the key purpose of the cooperative? Is it to address any specific social issue or earning money?

Q7: Will the cooperative be a non-profit organization? If so, how it will be operated? How it will be different from the participants involved in the conventional mud-crab value chain?

Social Business Lesson 2:

Q8: Who will be the key partners or members of the cooperative? How they will work?

Q8 (a): Will the partners compete with each other or they will complement each other?

Q8 (b): On what basis the resources and expertise of the partners will be utilized?

Q8 (c): Do you think cooperation and partnership will be beneficial for the value chain participants, especially for the crab fishers? How it is different from the existing value chain?

Social Business Lesson 3:

Q9: Considering that cooperative will be new initiative for mud-crab value chain, is there any scope for experimenting new ideas through the cooperative?

Q9 (a) Small experiment for introducing a new product?

Q9 (b) Continuous experiment for income generation?

Q9 (c) Do you think such experiment will lead to acquire knowledge and generate societal growth?

Q9 (d): Do you think the value chain participants have intention to bring such changes? Is it possible to bring such changes and experiments in the existing value chain structure?

Social Business Lesson 4:

Q10: How the cooperative will be financed as it will be a non-profit organization? Is there any alternative and innovative source of finance?

Q10 (a) What will be the return to the shareholders? Will there be any social return or conventional monetary return?

Q10 (b) Who will be the shareholders of the cooperative? How will they be selected?

Q10(c) Would the shareholders be updated about the social objective of the cooperative? If so, why and how?

Q10 (d): Do you think existing mindset of the possible shareholders will be compatible to the not-for-profit initiative? How do you create a social mindset for the shareholders?

Social Business Lesson 5:

Q11 (a): Which specific social gain/profit the cooperative will be targeting? Are there any conflicts among them?

Q11 (b) Is it possible to attain such social gain/profit keeping the existing value chain? Why or why not?

Appendix 4.2: Sample Qualitative Group Interview Transcript

Question wise Group Discussion Schedule 1 – Sitakundo (3 Crab Fishers)

Name: Jogendro Jolo Das; Roghu Jolo Das; Mohon Das.
Age: 80, 37, and 45 Gender: Male
Function /profession: Crab catchers
Location: Mirer Hat
Area: Sitakundo.

General Questions:

Q1: Please introduce yourself and describe how the crabs are distributed and marketed from coastal areas.

Answer: My name is Jogendro Jolo Das. I catch crab only and do not do anything else. I am 80 years old and I have been catching crabs for the last 45 years. I usually catch crab with my hands, pour them in a "TUKRI" (a pot made of bamboo to carry raw crabs) and bring all crabs at my home. Then I pile the entire catch, grade them based on the grade like size, weight, physical condition, etc. and put them in in different "TUKRI". Then I sell it in the market to different parties. I also sell the rest (mainly damaged or small sized crabs) in the local village.

Jogendro: We, the crab catchers in Sitakundo collect crab from the big fishing net of a large boat owned merchant fishermen. Once the boats come back from a fishing trip, then we collect crab the fishing net. We collect raw crab based on a contract with the net owner i.e. the boat owner. The contract is worth of about 5000 - 6000 taka yearly. We mainly collect crabs from the net throughout the year. For this reason, we have to take loan in interest from our relatives, or neighbours, different cooperatives like Grameen Bank etc. to pay to the net owners or the boat owners. We return this money with interest after selling the crabs in the market. In this process we at Sitakundo collect raw crabs and earn our livelihood. Sometimes even the net making cost is also charged on us by the owners. Even we often have to pay free labour and lend open spaces near their households (as we live in nearby to the shore) to the boat and net owners for the sake of being allowed to collect crab from the net after the fishing trip. The fishermen/net owner use base stand (KHUTI) to fix a net for a crab trip in a vast large area with the help of lots of workers (i.e. crab catchers). So, free labour, net making cost and rent for the net, all we need to pay (either in cash or in kinds) for crab collection.

In general, we go to the river bank with 5/6 pots (Tukri) and wait near the shore where the boat banks to observe how much crabs are in the net. If I see that the quantity of crab is sufficient or huge, then we make a call (through our mobile) to our family to come here and help me. They come to me with extra pots and other

relative instruments to collect the crabs with me from the net smoothly. This is what happens during "VATA". It is necessary to finish collection before the arrival of the next tide. They collect crab with me, and help me in every step. After returning home they do the other things like sorting, grading, separation based on physical structure (such as male vs female), cleaning, claw wrapping, placing in different pots based on grading, etc. for selling purpose.

At the end of CHAITRA, mainly in the month of BOISHAKH, the supply will increase due to favourable seasonality effect on production. The peak season consists of BOISHAKH, JAISHTHA and AASHAR – these the three months. Mud crabs are found in abundance both in quantity as well as in large size during this peak season. In this season the size and the quantity of mud crabs are bigger than the rest of the year.

Roghu: My name is Roghu Jolo Das. I am 37 years old. I have 17/18 years' experience in crab catching. Usually I do this job to collect mud crab from different hole by "SHIK" which is made of iron. I can realize their presence when any crab make sounds by their claw like "KHATAR", "KHATAR" on the "SHIK". Then I pull it out by the trap. Thus I do mud crab fishing for my livelihood through selling them in the market.

Mohon: My name Mohon Das, I do fishing business.

Q2: Please describe the key drawbacks of the existing mud crab value chain.

Answer:

Seasonality: **Jogendro:** Crab supply is low during winter (Sept-January) season. But I have my own Dhoijja that's why I get more than others. So, unlike others, it does not affect my livelihood. At that time the crab size are comparatively smaller than the Boishakh month. That's why the price of the crab is also less compared to other time of the year, which influences our income.

Roghu: Big crabs are not so available during winter; may be only few in numbers are available. For example, in my trap, I can catch only 20/30 big crabs which are more than 300 grams in weight. Again I don't have any DHOIJJA to catch 60/70 big crabs in one trip. This is one of the factors that affect our life during dull season.

Roghu: I also catch crab with SHIK. It is really tough to maintain the family cost with this crab business. My daily income is 300 - 400 taka from the crab business. In peak seasons crab catching is sufficient to continue the expenditure for everyday livelihood. But during the rest of the year when the supply of the crab decreases, its' really impossible to maintain the livelihood cost. I have to do other jobs temporarily in the off peak season like in winter. I do work as extra labour in

Aashar and Shrabon in different jobs to get money to maintain my livelihood cost. Again, I do fishing in winter season for the same reason.

> ***Price:*** The pricing of crab differs on size, weight and shell structure. The suppliers basically give the half price of what they get after selling it to the exporter. Such as if the suppliers receive 200 taka for one piece of crab weighing more than 500 gram (>500 gm), they offer us 100 taka. They give excuses that they have other expenses for further sorting, grading. washing, storing, etc. They also emphasize that numerous people are involved in the process of transporting the crabs to the exporter or exporters' agent who do various other activities.
>
> ***Loan:*** We the crab catchers have to take loan from on interest from the money lenders, NGOs such as Grameen Bank or from our relatives to go for a contract with the net or boat owners so that we receive permission from them to collect crabs from their net.
>
> ***Cyclone:*** Raghu: we do suffer in cyclone, storm or any other natural disaster. Basically in that time crabs become rare. We have to take loan to recover from these disasters like our accommodation repair, food purchase etc.

Jogendro: Now-a-days, natural disaster is less destructive for us because we can get advance information on it through radio and go to safe place or take necessary pre-cautions.

Social Business Lesson 1:

Q3: Do you think existing crab distribution and marketing system needs to be changed? Please describe why and how?

Answer: Yes, we think Govt. should take steps to bring change in the crab business and develop our conditions. Everybody says that they are really interested if Government take any good step to change the total system of the crab business. If it happens then we hope it will improve our life and livelihood. We hope that the demand of crab will increase, more parties will be involved and we can earn more money through a favourable change in the crab business. It is not possible to change the crab quality but more demand and improvement in the transportation and distribution system might have a positive impact. In this way, more parties (i.e. buyers) will be involved and in turn, our bargaining power as well the price of raw crab will increase.

Q4: Are you aware of cooperative? Do you think establishing a cooperative in the value chain will be useful for all the value chain members especially for crab fishers? How?

Answer: Yes, we are aware about cooperative. In Sitakundo, there are two types of cooperative, one is Grameen Bank cooperative and another one is family cooperative. If government is interested to do anything for the crab fishers through the cooperative that is great. We hope that it will decrease our loss and increase our bargaining power to get good market price of crab. Again if they (cooperative) give us different training for starting crab fattening project, it will be more encouraging for us. Cooperative should work for improving the livelihood of the crab fishers; and if so, we, without any hesitation, will join in the cooperative as a member. We hope, with the help of the cooperative we will work together and can receive better price from parties (middle men/supplier) for the crab.

Cooperative can provide necessary loan in simple terms and conditions to the poor crab fishers. They can organize different training program for us and we are interested to participate there. Even with the loan we can do extra business or purchase fishing net to earn money. Suppose, price of Hilsa fishing net is 5/6000 taka and big fishing net is 15/20000 taka. Again, many things are required to catch crab like boat, fishing boat gear, fishing boat, shik, soan (chimta), Tukri, etc., which can also be provided by the cooperative at a small charge (or fees) to us.

Cooperative may also introduce programs to train fishers on crab farming. Basically, lots of baby crabs are automatically caught by the net during the time of collecting crabs. These baby crabs can be sent to farm to get better price in future. To introduce or to run a project like crab farming, it is necessary to have proper knowledge of farming. We will be really happy if the cooperative can initiate similar project and involve us in the process. But there is no such arrangement has taken so far by the government. Thus relevant training and different projects activities of the cooperative may improve our life and livelihood sustainable.

Roghu: If cooperative helps 15-20 people to start a crab fattening project that will be great to save the baby crab as well as more employment and thus more income will be generated from this sector. It is possible to improve the baby crab in a reasonable market size through farming to get better market price through exporting or selling to the local market. Only the trained fishers or project holders can ensure this. This all could be possible by the establishment of crab cooperative.

Jogendro: If cooperative starts we can easily sell our total catch in nearer place. This will help us in a way that we need not to find parties to sell the goods or to make a call to tell them to come and buy the crabs. On the other side we can get the guarantee of selling all the products at a time and can get the full price from it in a better price. I hope it will decrease our transportation cost, time consumption, mental stress of finding parties ad to communicate with them and increase our bargaining power. We can more freely enjoy our job.

Q5: What is your perception about the difference between a cooperative and a conventional profit oriented organization?

Answer: Jogendro: Cooperative can be made of our common efforts but conventional organizations are individual. In our current system of crab business, we are not united and we catch crab individually. So if we can come together and make a cooperative that will be beneficial for us.

Raghu: If we sell our entire catch through the cooperative it will save our time and cost of transportation. Distance and time are key factors to deliver crab to the buyer parties from the catching area.

Jogendro also said: If cooperative starts, we can easily sell our total catch in nearer place. This will help us in a way that we do not need to find parties to sell the goods or to make a call to tell them to come and buy the crabs. On the other side, we can get the guarantee of selling all the products at a time and can get the full and better price. I hope it will decrease our transportation cost, time consumption, mental stress of finding parties and to communicate with them. It will also help us to increase our bargaining power. We can more freely enjoy our job.

Q6: What will be the key purpose of the cooperative? Is it to address any specific social issue or earning money?

Answer: Jogendro: The key purpose of the Cooperative should to ensure better livelihood of the crab farmers. They should take care of their sorrow or different losses that they incur/experiences in their crab related activities.

Cooperative may introduce programs to train fishers on crab farming. Basically, lots of baby crabs are automatically caught by the net during the time of collecting crabs. These baby crabs can be sent to farm to get better price in future. To introduce or to run a project like crab farming, it is necessary to have proper knowledge of farming. We will be really happy if the cooperative can initiate similar project and involve us in the process. But there is no such arrangement has taken so far by the Government. Thus relevant training and different projects activities of the cooperative may improve our life and livelihood sustainable.

Jogendro: If cooperative starts we can easily sell our total catch in nearer place. This will help us in a way that we need not to find parties to sell the goods or to make a call to tell them to come and buy the crabs. On the other side we can get the guarantee of selling all the products at a time and can get the full price from it in a better price. I hope it will decrease our transportation cost, time consumption, mental stress of finding parties ad to communicate with them and increase our bargaining power. We can more freely enjoy our job.

Thus more training and different cooperative activities can improve our live and livelihood sustainable.

Roghu: If cooperative helps 15-20 people to start a crab fattening project that will be great to save the baby crab as well as more employment and thus more income will be generated from this sector. It is possible to improve the baby crab in a reasonable market size through farming to get better market price through exporting or selling to the local market. Only the trained fishers or project holders can ensure this. This all could be possible by the establishment of crab cooperative.

Q7: Will the cooperative be a non-profit organization? If so, how it will be operated? How it will be different from the participants involved in the conventional mud crab value chain?

Answer: Mohan: Cooperative can be run based on the subscription of its members. It can also be run based on profit that it will make. If the cooperative buy from us at a higher price than current price level and then how higher price it will sell it to external other parties or the exporter and earn profit will not interest us. We will have no objection on it.

If we can sell our total catch through the cooperative in right time and in right price or at higher price than what we receive now then the cooperative will be more preferable than the existing system; and we will become member immediately. We will not be concerned or worried about how much profit the cooperative will make.

Therefore, it would be really good if the cooperative can earn profit by ensuring the improvement of the crab fishers through enabling more income for us and can make crab fishers livelihood sustainable. We will not have any problem in that case.

In the win-win situation, everything should be possible and positive to run but if cooperative tries only to earn their own profit rather than benefiting us, then we will not support that type of cooperative and it will be a wrong step.

Social Business Lesson 2:

Q8: Who will be the key partners or members of the cooperative? How they will work?

Answer: We the crab fishers want to be the member of the cooperative. We do not want the suppliers or the exporters as our crab cooperative member because they will again by imposing their power and influence sure exploit us in a new frame or in secured venture. Here the all crab fishers are work together for our improvement. Under the cooperative rules we can extend our partnership with the crab suppliers or with the exporters for the business purpose in a formal way. Then they will work or help us or our cooperative or will listen our demand in due manner for their income as well as for our income. Thus the members and the partners of the cooperative may be defined and work cooperatively for each other for the total prospers of the crab business sector.

Q8 (a): Will the partners compete with each other or they will complement each other?

Answer: Jogendro: If the crab cooperative starts to work, we all will be the member of that and we will work together in a cooperative manner so that we can achieve our objectives. So we need not to compete with each other. As we are not united now, we cannot bargain with the suppliers or aratders rather we have to take the low price that they offer as each of us tries to sell our crabs to the supplier. So, basically we compete with each other. On the other hand, if we can be united through Cooperative, the supplier will be forced to buy from us as nobody is going to sell him separately. By our united cooperative mentality we can ensure better price for the crab to different parties through more bargaining which will sustain our livelihood.

Further, we have good relation with the parties who purchased crab from us. Usually we make a call to them after preparing the crabs to sell. They came to our place and take the products to their place. Sometimes we do the same for the parties. In that case they give 50-60 taka as a transport cost or for tea cost. Parties generally give us 15 taka per 100 grams crab, and they get at least 25 taka per 100 grams. Party take weight of each crab by meters and pay as per weight. Basically they paid half price of crab what they get from the further sell.

Roghu: Yes, I agree with what Jogendro said. I also have good terms with the parties (aratders) for selling crabs. Sometimes they come to me and sometime I go to Sitakundo to deliver the crab to them. But they don't give me any transport cost or like that.

We the crab fishers will be the members of the cooperative but not the suppliers. If suppliers become members in our cooperative, they will start manipulating the situation on their behalf as they have got more money, power, and network.

If we see that the cooperative is beneficial for us, there is nobody to resist us to join in the cooperative. We are united and interested here to join in the crab cooperative. Our motive is to change our life and improve our livelihood. Parties will not have any say regarding our joining. We have a good relation with the parties as well.

Our family members always help us to improve our livelihood and job pattern. So in joining cooperative they will encourage us in all aspects. They will not resist at all. In fact, what we say is final as they are mostly do the household works. We hope that if we become the member of the cooperative it will motivate the other farmers to become its' member immediately.

Q8 (b): On what basis, the resources and expertise of the partners will be utilized?

Answer: We can utilize the resources that we have now. If we become members of the cooperative and if we are to cooperative each other, we are likely to share our

physical resources. For example - I have had 2 “DHAIJJA” by my own. I have purchased a new one. I can share these or rent these to another member if I do not go for collecting crab due to illness or any other problem.

Usually with these 3 dhaijja, I can collect almost 2/2.5 TUKRI crab of different size. One each tukri can contain more than hundred crabs. I took all the tukri by van to my home, which is 1.5 km far from the place of collection. I do cost 20-50 taka as van charge for this purpose. My family members usually helped me to do the grade on the collected crabs and keep them in different pot like tukri. They do the grade by size and the existing physical condition of the crab like hard shelled and soft shelled. Again they do another grade for the damaged crabs like which have injured leg or broken legs etc. I do make a call to the different parties who regularly purchase crab from me. After receiving information on available crab, they come to my place or sometimes I do that for them. I do sell the quality crab in big size and having hard shell on it to them i.e.; to the parties like aratders or collectors, who further sell it to the exporters and send all in Dhaka through container at night time.

The cooperative itself may also have some physical resources. I think with Govt. help, cooperative might have adequate resources to help crab fishers specially those who do not have any physical resources. It can lend the resources to the fishers at low price.

Cooperative can also help us in other activities especially during the off season. They can train us to do some farming in Govt. Khas land which will help us to earn money during off season. If we are trained by the cooperative to do small poultry or cane and bamboo works, that would be great. Once we become expert, we can also teach other persons who will be interested.

Q8 (c): Do you think cooperation and partnership will be beneficial for the value chain participants, especially for the crab fishers? How it is different from the existing value chain?

Refer to the answer of the question no. 5 and 6.

Social Business Lesson 3:

Q9: Considering that cooperative will be new initiative for mud crab value chain, is there any scope for experimenting new ideas through the cooperative?

Answer: Yes, it is possible to take different type of experiment to solve various social problems such as employment generation or to introduce new crab fattening project or to train the unemployed people to start such project through the cooperative operation. It is better to utilise the profit money of the cooperative for further improvement or problem solve like to purchase fishing net, knitting net, or buying different gears for crab catching, etc.

Q9 (a): Small experiment for introducing a new product?

Answer: Yes, small experiment is possible such as solving different types of social problem one after another.

Q9 (b): Continuous experiment for income generation?

Answer: Such experiment can continue for longer period as long as it serves our societal or group welfare and do not become corrupted.

Q9 (c): Do you think such experiment will lead to acquire knowledge and generate societal growth?

Answer: If small experiments become successful then we can use our experience for further solution of the social problems. In that way, of course, we will acquire new knowledge with such experiments and as the experiments are dedicated to deal with social issues, it will likely to ensure social growth.

Q9 (d): Do you think the value chain participants have intention to bring such changes? Is it possible to bring such changes and experiments in the existing value chain structure?

Answer: Yes, it's not that only we the crab fishers needs to change our mind and try to change the crab business and our livelihood, crab parties or aratders as well as exporters also need to think about us. Again, they are already united and often try to cheat with us. They often give us less price of our product. They also sometimes give less in per kilo. So, they must be changed as well.

If we are united through a cooperative, have more bargaining capacity and can control the supply of the crab, I think the aratders will forced to cooperate and listen to us. If we can become successful in cooperative, then we can even add condition or request the aratders and exporters to help/donate to our social projects (experiments to solve our social problems).

Social Business Lesson 4:

Q10: How the cooperative will be financed as it will be a non-profit organization? Is there any alternative and innovative source of finance?

Answer: Mohan: Cooperative can be run through the member subscription as well as Govt. help. It can also earn money by the final selling of crab after paying the due price to the fishers. The extra profit they can save as extra income to support fishers in their different social problems.

Again, Cooperative can collect little money from all the fishermen like 50 taka in every month after selling the crab to the parties. Even it is possible to introduce few

scopes for extra earning like preparing fishing net and sell it to the villagers, making tukri and selling it to the crab fishers. These will help bearing the operation cost as well as can be a good source of income for cooperative. We hope cooperative will also help us in this way by lending 10000-20000 taka in our crisis and we can return it instalment.

It is clear that the first step or the initial set up cost of a cooperative should come from the Government; and then, from different income of the cooperative, it can manage its other operational cost. The officials/members of the cooperative must be honest and should consider the betterment of the crab fishers.

Q10 (a) What will be the return to the shareholders? Will there be any social return or conventional monetary return?

Answer: Mohan: If the cooperative can earn more or can do more income through its operation then we will be benefited again as well as the shareholders will be benefitted too. Because, the shareholders are also the members like us. So, the changes or developments that are meant to happen to crab fishers will be of beneficial to the shareholders. Moreover, if the cooperative runs smoothly and generates income, the shareholder can take salary/remuneration for their time and service to the cooperative. Initially, it can be the voluntary service but later or once become established, the shareholders can think to receiving remuneration. But if it is share of profits or dividends, then the cooperative will have fewer funds to support for future social problems.

Again, if the cooperative give a certain portion of their profit to us for further investment or for further business then we can earn extra money from that and can repay the profit amount. Cooperatives may not give cash to anybody's hand; rather they may try to solve any other social problem like primary school, drinking water supply, sanitation, transportation or diagnostic facility, etc. for the village people that would more appreciated. We really prefer to solve any other social problem which are suffered by us and will not be removed for the future time.

Jogendro: It would be good if the cooperative keep their profit to their own and reinvest it to solve a new social issue or problem rather than sending them in government fund. We prefer the social problem solution for our family members or villagers like vaccination, tube well, road, etc. for the long term service. We feel that cash is tuff to hold or does not stay long, so it is better to use it for a big motto.

Q10 (b) Who will be the shareholders of the cooperative? How will they be selected?

Answer: Jogendro: if we are benefited from the establishment of cooperative, then anyone can be the owner/shareholder – Govt. or we, other people; there is no argument.

Mohan: It will be better if we can be the owner. But first there should be one learned person who understand the terms and conditions of running the cooperative in right manner and how to deal with every legal issues for our betterment, who will explain us easily about all the matters, how to do those and when. We all are not educated that may make a problem to take the ownership.

It will be easy to take various decisions in our favour if we become the owner and we can solve social problem based on our or villagers' priority. But if others (such as aratders) are the owner they may not realize our problems and may not take right action in right time.

Q10(c) Would the shareholders be updated about the social objective of the cooperative? If so, why and how?

Answer: The committee or chief of the cooperative can update the other members. The chief can be elected or selected but he should be honest and motivated to work for the benefit of the crab fishers. However, the first chief should be appointed by the Govt. and it is crucial that he is honest and caring about the welfare of the crab fishers.

Q10 (d): Do you think existing mindset of the possible shareholders will be compatible to the not-for-profit initiative? How do you create a social mindset for the shareholders?

Answer: I think Govt. may help here by appointing a good character person who will lead to bring a change and he must be an honest man. It is really difficult in today's time as often a learned person who is in charge, he might become corrupted. They all start with a good intention and social centric purpose but after some days, they manipulate the situation and become dishonest.

Social Business Lesson 5:

Q11 (a): Which specific social gain/profit the cooperative will be targeting? Are there any conflicts among them?

Answer: Raghu: If the aratders become the member of the cooperative then it may not bring any benefit to us because they always give us less than market price for the crabs what they sell to us. They usually pay the half price of the crab what they get after selling it to the exporters. As they are more powerful due to their money and network, they will likely to manipulate the entire situation to their benefit not ours.

Mohan: I think he is right. If aratders are the members, they will not pay the market price for our crab, which may hamper our livelihood improvement. They will try giving the previous price what they are used to pay for crab now. They will show their different problems to the cooperative to solve which will decrease our

bargaining power or the possibility to get higher price from the outside parties. They will try to recover their cost from the cooperative.

Jogendro: If they purchase all crab from the cooperative in 80000 taka but they are able to sell it 60000 taka then they will try to recover the loss of rest of the money from the cooperative. So if they become the member there is no benefit for us rather it will cause even further loss for us.

Mohan: If aratders become member of the cooperative, the price of crab will be fixed by them. There is no chance of bargaining. So if they don't join the cooperative that is better for us. They are solvent to purchase crab from us. So, why they need to be the member here? Rather, if they stay outside as a buyer of crab then it will increase our bargaining power and more party will involve here and compete each other to purchase crab through the cooperative which can ensure better market price and more income for the crab fishers.

Q11 (b) Is it possible to attain such social gain/profit keeping the existing value chain? Why or why not?

Answer: Mohan: Off course, there is no problem to retain the profit as savings of the cooperative for further investment or for any long term future problem solution. I hope shareholders will not demand the money in cash rather than solve a social problem. If improvement is visible more people will be interested to join the cooperative for different type of activities or job. It is also possible to start the cooperative with the initial money collection from the shareholders or members.

If cooperative involves many projects to relating to different social issues, employment opportunities will be created and our family members can do job here; and thus, can earn extra money. Thus the incomes of all family members can contribute to solve our livelihood problems and make their life simple and sustainable.

Thank you!

Appendix 5.1: Questionnaire for Crab Fishers

Section I

Q1: The following questions are related to your *"Skill, experience and the extent of involvement in crab fishing".* Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
IFS1	I am skilled at crab fishing.	1	2	3	4	5	6
IFS2	I consider myself knowledgeable about crab fishing.	1	2	3	4	5	6
IFS3	I know less than most other fishers about crab fishing (R)	1	2	3	4	5	6
IFS4	I know how to catch crab in different seasons.	1	2	3	4	5	6
IFS5	I am quite familiar with crab fishing.	1	2	3	4	5	6
IFE1	I have a good experience in crab fishing.	1	2	3	4	5	6
IFE2	I am experienced in crab catching.	1	2	3	4	5	6
IFE3	I have been involved in crab fishing for a long time.	1	2	3	4	5	6
IFI1	I am involved in all aspects of crab fishing.	1	2	3	4	5	6
IFI2	I am more involved in crab fishing than other activities.	1	2	3	4	5	6
IFI3	I catch crab on a regular basis.	1	2	3	4	5	6
IFI4	Crab fishing is an important part of my life.	1	2	3	4	5	6

Q2: The following questions are related to your "*Relationship with the suppliers and other crab fishers".* Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
CFSI1.	The supplier has more market information than us.	1	2	3	4	5	6

CFSI2.	The information that suppliers provide us is useful.	1	2	3	4	5	6
CFSI3.	We have to rely on the information provided by the suppliers.	1	2	3	4	5	6
CFSI4.	The supplier may not give us loan if we don't follow their requests.	1	2	3	4	5	6
CFSI5.	Negotiating price with the supplier is very difficult for us.	1	2	3	4	5	6
CFSI6.	Suppliers often use a tinkered weighing machine while weighing raw crab.	1	2	3	4	5	6
CFSI7	Suppliers often try to recover their system loss by paying less on total weight for the raw crab.	1	2	3	4	5	6
CFVC1.	We do not like what the suppliers do in the name of assistance through advance loan.	1	2	3	4	5	6
CFVC2.	Suppliers do not consider our interest in negotiating fair price.	1	2	3	4	5	6
CFVC3.	Suppliers prevent us from obtaining accurate weight of the crab.	1	2	3	4	5	6
CFVC4.	Suppliers do not have our best interests at heart.	1	2	3	4	5	6
CFVC5.	We disagree with suppliers on critical issues (e.g., fair price, correct weight)	1	2	3	4	5	6
CFVC6.	We are rarely in agreement with the suppliers in day to day transaction.	1	2	3	4	5	6
CFVC7.	We have a tense relationship with the suppliers.	1	2	3	4	5	6
CFHC1	We often compete with each other to sell our catch to the same supplier.	1	2	3	4	5	6
CFHC2	Suppliers compete with each other from which crab fishers they will buy the raw crab.	1	2	3	4	5	6
CFHC3	There are lot more crab fishers than the suppliers in this area.	1	2	3	4	5	6

Q3: The following questions are related to your "*Attitude towards establishing a crab fishers' cooperative*". Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷					**Strongly Agree**
ATC1	Establishing a fishers' cooperative will be a better alternative than the existing system.	1	2	3	4	5	6

ATC2	I think it will be good for me to sell our crab through the cooperative.	1	2	3	4	5	6
ATC3	I think cooperative will help us to sustain our profession.	1	2	3	4	5	6
ATC4	Engaging with the cooperative will not be trustworthy for us. **(R)**	1	2	3	4	5	6
ATC5	In my opinion, it is desirable to be involved with cooperative for our own benefit.	1	2	3	4	5	6

Q4: The following questions are related to "*Potential Benefits*" that you might receive from a fishers' cooperative. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷					**Strongly Agree**
PBCMI1	A crab cooperative can provide us with a secure income.	1	2	3	4	5	6
PBCMI2	Crab selling through a cooperative will be more convenient for us than the conventional system.	1	2	3	4	5	6
PBCMI3	I will be able to receive a better price than before if I sell crab through a cooperative.	1	2	3	4	5	6
PBCMI4	I believe selling through a cooperative is a better idea to earn more income.	1	2	3	4	5	6
PBCMI5	I think I will receive a fair price if I sell crab through a cooperative.	1	2	3	4	5	6
PBCMI6	I believe selling through a cooperative will help us getting rid of the dominance of the suppliers.	1	2	3	4	5	6
PBCAI1	A cooperative will generate new employment opportunities for our family members.	1	2	3	4	5	6
PBCAI2	A cooperative will enable us to earn money from alternative sources of new crab based products.	1	2	3	4	5	6
PBCAI3	A cooperative will help us to be employed all the year round.	1	2	3	4	5	6
PBCAI4	A cooperative will assist us producing supporting products related to crab marketing.	1	2	3	4	5	6
PBCC1	A cooperative will be compatible with the existing crab value chain.	1	2	3	4	5	6

PBCC2	Working through cooperative will not change my crab fishing activities.	1	2	3	4	5	6
PBCC3	Selling through cooperative will fit well with my daily work style.	1	2	3	4	5	6

Q5: The following questions are related to potential barriers that you think may exist while establishing a fisher's cooperative in the existing crab value chain. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷ **Strongly Agree**					
PBDL1	I fear that the leaders of the cooperative may act dishonestly.	1	2	3	4	5	6
PBDL2	I fear that the leaders of the cooperative might influence the situation for their own profit.	1	2	3	4	5	6
PBDL3	I am afraid that the leaders of the cooperative may double-deal.	1	2	3	4	5	6
PBDL4	I am afraid that the leaders of the cooperative may misuse their power.	1	2	3	4	5	6
PBLT1	The crab suppliers are not concerned about our welfare.	1	2	3	4	5	6
PBLT2	The crab suppliers are honest and truthful. **(R)**	1	2	3	4	5	6
PBLT3	Promises made by the crab supplier are unreliable.	1	2	3	4	5	6
PBLT4	The crab suppliers have low degree of integrity.	1	2	3	4	5	6
PBLT5	I have great confidence on the crab suppliers. **(R)**	1	2	3	4	5	6
PBLU1	We do not have any unity among us.	1	2	3	4	5	6
PBLU2	We are seldom in consensus about any issue.	1	2	3	4	5	6
PBLU3	We rarely keep our agreement among ourselves for selling crab.	1	2	3	4	5	6
PBLU4	We do not have any team work for improving our livelihood.	1	2	3	4	5	6
PBLU5	We cannot work in a team with suppliers.	1	2	3	4	5	6
PBLU6	The suppliers usually cooperate with us.(R)	1	2	3	4	5	6
PBLU7	The suppliers usually disregard our opinion about an issue of common interest.	1	2	3	4	5	6

Q6: The following questions are related to potential s*ocial factors* that might influence the adoption of a cooperative. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
SIPI1	I will join in the cooperative if I see other fishers are joining.	1	2	3	4	5	6
SIPI2	I will engage with the cooperative activities if most people who are important to me think in the same way.	1	2	3	4	5	6
SIPI3	I will sell my crabs through the cooperative if most people who are important to me think in the same way.	1	2	3	4	5	6
SIPI4	With regard to joining in the cooperative, I want to do what other fishers wish to do.	1	2	3	4	5	6
SIFI1.	I will sell crabs through the cooperative if my family members wish me to do so.	1	2	3	4	5	6
SIFI2.	With regard to joining in the cooperative, I want to do what my family members expect me to do.	1	2	3	4	5	6
SIFI3.	I will join in the cooperative if my family members think that I should.	1	2	3	4	5	6

Section II

Q7: The following questions are related to the nature or type of *supports from the Government* that you think are most important for adopting a cooperative. Please indicate the importance of the following statements from least to highest important (please circle ONLY one number for each statement).

	I think, Government support is required for -	Least Important ⟷ Highest Important					
SFGS1	- taking initiative to form the fishers' cooperative	1	2	3	4	5	6
SFGS2	- enacting the operating rules for the cooperative	1	2	3	4	5	6
SFGS3	- managing the operations of the cooperative	1	2	3	4	5	6
SFGS4	- infrastructure for the establishment of the cooperative	1	2	3	4	5	6

SFGS5	- initial capital for the cooperative	1	2	3	4	5	6
SFGS6	- organizing required training	1	2	3	4	5	6
SFGS7	- motivating crab fishers to join in the cooperative	1	2	3	4	5	6

Q8: The following questions are related to the nature or type of *supports from the (non-government organizations) NGOs* that you think are most important for adopting a cooperative Please indicate the importance of the following statements from least to highest important (please circle ONLY one number for each statement).

	I think NGO support is required for -	**Least Important ⟷ Highest Important**					
SFNS1	- taking initiative to form the fishers' cooperative	1	2	3	4	5	6
SFNS2	- enacting the operating rules for the cooperative	1	2	3	4	5	6
SFNS3	- managing the operations of the cooperative	1	2	3	4	5	6
SFNS4	- infrastructure for the establishment of the cooperative	1	2	3	4	5	6
SFNS5	- initial capital for the cooperative	1	2	3	4	5	6
SFNS6	- organizing required training	1	2	3	4	5	6
SFNS7	- motivating crab fishers to join in the cooperative	1	2	3	4	5	6

Q9. The following questions are related to your "*Intention to be engaged with a cooperative*". Please indicate to what extent do you agree or disagree with the following (please circle ONLY one number for each statement)

Statements		**Strongly Disagree ⟷ Strongly Agree**					
INC1.	I intend to participate in the cooperative.	1	2	3	4	5	6
INC2.	I am willing to be engaged with the cooperative for the crab business.	1	2	3	4	5	6
INC3.	I will sell crabs through the cooperative.	1	2	3	4	5	6
INC4	I am likely to be involved with the cooperative to achieve my professional	1	2	3	4	5	6

	objectives.						
INC5.	I intend to use the cooperative rather than the traditional system of crab selling.	1	2	3	4	5	6
INC6.	I will recommend others to be involved with the cooperative.	1	2	3	4	5	6
INC7	I will encourage my peers to sell their crabs through cooperative.	1	2	3	4	5	6

Q10. The following questions are related to your p*erceived sustainable livelihood* through engaging with the fishers' cooperative. Please indicate to what extent do you agree or disagree with the following (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷					**Strongly Agree**
PSL1	My livelihood will be enhanced if I become engaged with the cooperative.	1	2	3	4	5	6
PSL2	My social wellbeing will be ensured by engaging with the cooperative.	1	2	3	4	5	6
PSL3	Engaging with the cooperative will enable us to conserve our natural resources (such as raw crab).	1	2	3	4	5	6
PSL4	Engaging with the cooperative will enable us to reduce our vulnerability.	1	2	3	4	5	6
PSL5	My livelihood will be ensured if I adopt and sell crabs through the cooperative.	1	2	3	4	5	6

Section III

Demographic Information:

1. Gender: (i) Male (ii) Female
2. Age (in year): (i) 18 - 24 (ii) 25-34 (iii) 35-44 (iv) 45-54 (v) > 55 years
3. Income: ……..… Tk.
4. Education: (a) Nil (b) Primary (c) below secondary (d) secondary (e) Others:
5. Duration of being involved in crab fishing: …….. Years
6. Is "Crab Fishing" your main source of income? (i) Yes (ii) No
7. What is your level of involvement in non-crab related activities?

   (i) Crab …….....% (ii) other .....%

8. Which assets do you have for the crab fishing?

   (i) Fishing boats (ii) Fishing nets (iii) Fishing gear

9. What is your parent's occupation? (a) Crab fishing (b) Crab supplier (c) Others: ……

10. Please state your location / District: ……

Thank you!

Appendix 5.2: Questionnaire for Crab Suppliers

Section I

Q1: The following questions are related to your skill, experience and the extent of involvement in the crab business. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
IFS 1	I am skilled in the crab business.	1	2	3	4	5	6
IFS 2	I consider myself knowledgeable about crab business.	1	2	3	4	5	6
IFS 3	I know less than most other suppliers about crab business. **(R)**	1	2	3	4	5	6
IFS 4	I know how to trade crab in different seasons.	1	2	3	4	5	6
IFS 5	I am quite familiar with the crab business.	1	2	3	4	5	6
IFE 1	I have a good experience in the crab business.	1	2	3	4	5	6
IFE 2	I am experienced in crab trading.	1	2	3	4	5	6
IFE 3	I have been involved in the crab business for a long time.	1	2	3	4	5	6
IFI1	I am involved in all aspects of the crab business.	1	2	3	4	5	6
IFI2	I am more involved in the crab business than other activities.	1	2	3	4	5	6
IFI3	I trade crab on a regular basis.	1	2	3	4	5	6
IFI4	Crab business is an important part of my life.	1	2	3	4	5	6

Q2: The following questions are related to your relationship with the fishers and other crab suppliers. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
CFSI1	We have more market information than the fishers.	1	2	3	4	5	6
CFSI2	The information that we provide to the fishers is useful.	1	2	3	4	5	6

CFSI3	The crab fishers have to rely on the information provided by us.	1	2	3	4	5	6
CFSI4	We may deny giving loan to the fishers if they don't follow our requests.	1	2	3	4	5	6
CFSI5	Crab fishers always make things difficult by negotiating price.	1	2	3	4	5	6
CFSI6	Fishers all the time have objections on the weighing machine when we weigh crab.	1	2	3	4	5	6
CFSI7	We often adjust our system loss by paying less on total weight for the raw crab to the crab fishers.	1	2	3	4	5	6
CFVC1	We assist the crab fishers by offering advance loan and pre-determining the crab price.	1	2	3	4	5	6
CFVC2	We often do not consider fishers' interest while determining the price for crab.	1	2	3	4	5	6
CFVC3	We always weigh the crab catch accurately. **(R)**	1	2	3	4	5	6
CFVC4	We do not have fishers' best interests at heart.	1	2	3	4	5	6
CFVC5	We disagree with crab fishers on critical issues (e.g., price, weight).	1	2	3	4	5	6
CFVC6	We are rarely in agreement with the crab fishers in day to day transaction.	1	2	3	4	5	6
CFVC7	We have a tense relationship with the crab fishers.	1	2	3	4	5	6
CFHC1	We often compete with each other to buy crab from the same fisher.	1	2	3	4	5	6
CFHC2	We often try to influence the same fisher to buy the raw crabs from.	1	2	3	4	5	6
CFHC3	There are lot more crab suppliers than fishers in this area.	1	2	3	4	5	6

Q3: The following questions are related to your attitude towards establishing a crab fishers' cooperative. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷					**Strongly Agree**
ATC1.	Establishing a fishers' cooperative will be a better alternative than the existing system.	1	2	3	4	5	6
ATC2.	I think it will be good for the fishers to sell their crab through the cooperative.	1	2	3	4	5	6
ATC3.	I think cooperative will help the fishers to sustain their profession.	1	2	3	4	5	6

ATC4.	Engaging with the cooperative will not be trustworthy. **(R)**	1	2	3	4	5	6
ATC5	In my opinion it is desirable for the fishers to be involved in cooperative for their benefit.	1	2	3	4	5	6

Q4: The following questions are related to potential benefits that the fishers might receive from a fishers' cooperative. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		**Strongly Disagree** ⟷ **Strongly Agree**					
PBCMI1	A crab cooperative can provide the fishers a secure income.	1	2	3	4	5	6
PBCMI2	Crab selling through a cooperative will be more convenient for the crab fishers than the conventional system.	1	2	3	4	5	6
PBCMI3	I will be able to offer a better price than before if I buy crab through cooperative.	1	2	3	4	5	6
PBCMI4	I believe selling through the fishers' cooperative is a better idea to earn more income for the fishers.	1	2	3	4	5	6
PBCMI5	I think I will be able to offer a fair price if I buy crab from a fishers' cooperative.	1	2	3	4	5	6
PBCMI6	I believe buying from a cooperative will help us to continue the existing system.	1	2	3	4	5	6
PBCAI1	A cooperative will generate new employment opportunities for the fishers' family members.	1	2	3	4	5	6
PBCAI2	A cooperative will enable the fishers' to earn money from alternative sources based on crab business.	1	2	3	4	5	6
PBCAI3	A cooperative will help the fishers to be employed all the year round.	1	2	3	4	5	6
PBCAI4	A cooperative will assist the fishers producing supporting products related to crab marketing.	1	2	3	4	5	6
PBCC1	A cooperative will be compatible with the crab value chain.	1	2	3	4	5	6
PBCC2	Working through a cooperative will not change my crab business activities.	1	2	3	4	5	6
PBCC3	Buying through a cooperative will fit well with my daily work style.	1	2	3	4	5	6

Q5: The following questions are related to potential barriers that you think are relevant while establishing a fisher's cooperative in the existing crab value chain. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
PBDL1	I fear that the leaders of the cooperative may act dishonestly.	1	2	3	4	5	6
PBDL2	I fear that the leaders of the cooperative might manipulate the situation to their own profit.	1	2	3	4	5	6
PBDL3	I am afraid that the leaders of the cooperative may double-deal with us.	1	2	3	4	5	6
PBDL4	I am afraid that the leaders of the cooperative may misuse their power.	1	2	3	4	5	6
PBLT1	We are not concerned about fishers' welfare.	1	2	3	4	5	6
PBLT2	We are honest and truthful. **(R)**	1	2	3	4	5	6
PBLT3	We often cannot keep our promises towards the fishers.	1	2	3	4	5	6
PBLT4	We have a high degree of integrity. **(R)**	1	2	3	4	5	6
PBLT5	The crab fishers have great confidence in us. **(R)**	1	2	3	4	5	6
PBLU1	We do not have any unity among us.	1	2	3	4	5	6
PBLU2	We seldom in consensus about any issue.	1	2	3	4	5	6
PBLU3	We rarely keep our agreement among ourselves when buying crab.	1	2	3	4	5	6
PBLU4	We do not have any team work for improving fisher's livelihood.	1	2	3	4	5	6
PBLU5	We cannot work in a team with the crab fishers.	1	2	3	4	5	6
PBLU6	We, the suppliers usually cooperate with the crab fishers. **(R)**	1	2	3	4	5	6
PBLU7	It is hard to consider fishers' opinion about an issue of common interest.	1	2	3	4	5	6

Q6: The following questions are related to potential social factors that might influence the adoption of a cooperative. Please indicate to what extent you agree or disagree with the following statements (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
SIPI1	I will support establishing a cooperative if I see other suppliers are supporting.	1	2	3	4	5	6
SIPI2	I will promote a cooperative if most people who are important to me think in the same way.	1	2	3	4	5	6
SIPI3	I will buy crabs from a cooperative if most people who are important to me buy in the same way.	1	2	3	4	5	6
SIPI4	With regard to supporting a cooperative, I want to do what other suppliers wish to do.	1	2	3	4	5	6
SIFI1.	I will buy crabs through cooperative if my family members wish me to do so.	1	2	3	4	5	6
SIFI2.	With regard to supporting a cooperative, I want to do what my family members expect me to do.	1	2	3	4	5	6
SIFI3.	I will promote the cooperative if my family members think that I should.	1	2	3	4	5	6

Section II

Q7: The following questions are related to the nature or type of supports from the Government that you think are most important for adopting a cooperative. Please indicate the importance of the following statements for least or highest important to you (please circle ONLY one number for each statement).

	Government support for -	Least Important ⟷ Highest Important					
SFGS1	- taking initiative to form the fishers' cooperative	1	2	3	4	5	6
SFGS2	- enacting the operating rules for the cooperative	1	2	3	4	5	6
SFGS3	- managing the operations of the cooperative	1	2	3	4	5	6
SFGS4	- infrastructure for the establishment of the cooperative	1	2	3	4	5	6
SFGS5	- initial capital for the cooperative	1	2	3	4	5	6
SFGS6	- organizing required training	1	2	3	4	5	6
SFGS7	- motivating crab fishers to join the cooperative	1	2	3	4	5	6

Q8: The following questions are related to the nature or type of supports from NGOs that you think are most important for adopting a cooperative. Please indicate the importance of the following statements for least or highest important to you (please circle ONLY one number for each statement).

	NGO support for -	Least Important ⟷ Highest Important					
SFNS1	- taking initiative to form the fishers' cooperative	1	2	3	4	5	6
SFNS2	- enacting the operating rules for the cooperative	1	2	3	4	5	6
SFNS3	- managing the operations of the cooperative	1	2	3	4	5	6
SFNS4	- infrastructure for the establishment of the cooperative	1	2	3	4	5	6
SFNS5	- initial capital for the cooperative	1	2	3	4	5	6
SFNS6	- organizing required training	1	2	3	4	5	6
SFNS7	- motivating crab fishers to join the cooperative	1	2	3	4	5	6

Q9. The following questions are related to your intention to support a cooperative. Please indicate to what extent do you agree or disagree with the following (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
INC1.	I intend to business with the crab fisher's cooperative.	1	2	3	4	5	6
INC2.	I am willing to trade with the crab fisher's cooperative for the crab business.	1	2	3	4	5	6
INC3.	I will buy crabs through crab fishers cooperative.	1	2	3	4	5	6
INC4	I am likely to be involved with cooperative to achieve my professional objectives.	1	2	3	4	5	6
INC5.	I intend to use the cooperative rather than traditional system of crab buying.	1	2	3	4	5	6
INC6.	I will recommend others to be involved with the cooperative.	1	2	3	4	5	6
INC7	I will encourage my peers to buy crabs through the cooperative.	1	2	3	4	5	6

Q10. The following questions are related to fishers' perceived sustainable livelihood through engaging with the cooperative. Please indicate to what

extent do you agree or disagree with the following (please circle ONLY one number for each statement)

Statements		Strongly Disagree ⟷ Strongly Agree					
PSL1	Crab fishers' livelihood will be enhanced if they become engaged with a cooperative.	1	2	3	4	5	6
PSL2	Crab fishers' social wellbeing will be ensured by engaging with a cooperative.	1	2	3	4	5	6
PSL3	Engaging with a cooperative will enable the crab fishers to conserve the natural resources (such as raw crab).	1	2	3	4	5	6
PSL4	Engaging with a cooperative will enable the crab fishers to reduce their vulnerability.	1	2	3	4	5	6
PSL5	Crab fishers' livelihood will be ensured if they adopt and sell crabs through cooperative.	1	2	3	4	5	6

Section III

Demographic Information:

1. Gender: (i) Male (ii) Female
2. Age (in year): (i) 18 - 24 (ii) 25-34 (iii) 35-44 (iv) 45-54 (v) > 55 years
3. Income: …….. Tk.
4. Education: (a) Nil (b) Primary (c) below secondary (d) secondary (e) Others:
5. Duration of being involved in crab business: …….. Years
6. Is "Crab Business" your main source of income? (i) Yes (ii) No
7. What is your level of involvement in non-crab related activities

   (i) Crab .....% (ii) other .....%
8. Which assets do you have for the crab business?

   (i) Fishing boats (ii) Fishing nets (iii) Fishing gear
9. What is your parent's occupation? (a) Crab fishing (b) crab supplier (c) Others:
10. Please state your location / District: …….

Thank you!

Appendix 6.1: Descriptive Statistics of Items (Crab Fishers and Crab Suppliers)

Table 6.5: Descriptive statistics of the items for crab fishers and crab suppliers

Constructs	Items	Crab Fishers		Crab Suppliers	
		Mean Statistic	Std. Deviation Statistic	Mean Statistic	Std. Deviation Statistic
Skill (IFS)	IFS1	5.68	.62	5.77	.54
	IFS2	5.63	.71	5.82	.46
	IFS3	5.05	1.45	5.44	1.09
	IFS4	5.56	.66	5.61	.61
	IFS5	5.57	.64	5.60	.59
Experience (IFE)	IFE1	5.50	.72	5.55	.63
	IFE2	5.51	.71	5.56	.65
	IFE3	5.61	.69	5.58	.65
Involvement (IFI)	IFI1	5.61	.66	5.68	.63
	IFI2	5.60	.72	5.65	.69
	IFI3	5.57	.73	5.73	.59
	IFI4	5.70	.58	5.73	.57
Supplier Influences (CFSI)	CFSI1	4.48	1.99	5.56	1.15
	CFSI2	3.65	1.92	5.21	1.13
	CFSI3	3.82	1.92	4.15	1.69
	CFSI4	4.34	1.60	3.97	1.51
	CFSI5	4.83	1.20	4.07	1.44
	CFSI6	4.45	1.69	2.44	1.43
	CFSI7	4.41	1.63	2.73	1.44
Vertical Conflict (CFVC)	CFVC1	4.91	1.39	3.98	1.69
	CFVC2	4.77	1.31	3.58	1.60
	CFVC3	4.64	1.38	2.04	1.33
	CFVC4	4.70	1.37	3.93	1.49
	CFVC5	4.87	1.21	3.77	1.46
	CFVC6	4.74	1.23	3.62	1.51
	CFVC7	4.08	1.49	3.04	1.55
Horizontal Competition (CFHC)	CFHC1	3.82	1.86	4.19	1.66
	CFHC2	3.80	1.99	4.07	1.53
	CFHC3	5.30	1.16	4.15	2.04
Attitude (ATC)	ATC1	5.29	.84	5.10	.79
	ATC2	5.23	.88	5.17	.77
	ATC3	5.24	.93	5.04	1.15
	ATC4	4.30	1.81	4.14	1.70
	ATC5	5.18	1.06	5.23	.89
More Income (PBCMI)	PBCMI1	5.24	.78	5.15	.76
	PBCMI2	5.28	.82	5.24	.72
	PBCMI3	5.33	.76	5.30	.77
	PBCMI4	5.35	.78	5.35	.74
	PBCMI5	5.43	.68	5.28	.72

	PBCMI6	5.42	.70	5.16	.91
Alternative Income (PBCAI)	PBCAI1	4.92	.77	5.30	.66
	PBCAI2	5.00	.71	5.33	.67
	PBCAI3	5.16	.73	5.04	.82
	PBCAI4	5.08	.85	5.11	.74
Compatibility (PBCC)	PBCC1	4.08	1.38	4.06	1.34
	PBCC2	3.37	1.81	3.41	1.71
	PBCC3	4.80	1.13	4.79	1.18
Dishonesty of Leaders (PBDL)	PBDL1	3.46	1.82	3.38	1.68
	PBDL2	3.47	1.75	3.38	1.68
	PBDL3	3.49	1.78	3.41	1.75
	PBDL4	3.52	1.78	3.51	1.70
Lack of Trust (PBLT)	PBLT1	4.83	3.12	4.29	1.32
	PBLT2	4.32	1.68	1.70	.90
	PBLT3	4.16	1.69	4.29	1.26
	PBLT4	4.52	1.43	1.73	1.03
	PBLT5	3.92	1.77	2.03	1.19
Lack of Unity (PBLU)	PBLU1	4.76	1.42	3.80	1.61
	PBLU2	4.75	1.27	3.95	1.48
	PBLU3	4.68	1.27	3.84	1.49
	PBLU4	4.92	1.16	4.12	1.52
	PBLU5	4.76	1.25	4.04	1.39
	PBLU6	4.10	1.61	2.22	.97
	PBLU7	4.62	1.18	4.95	.92
Peer Influences (SIPI)	SIPI1	5.30	.92	5.11	.93
	SIPI2	4.87	1.39	4.91	1.17
	SIPI3	4.96	1.30	5.03	1.16
	SIPI4	5.29	.85	4.91	1.05
Family Influences (SIFI)	SIFI1	4.91	1.27	4.85	1.11
	SIFI2	5.05	1.17	4.98	1.08
	SIFI3	5.06	1.24	5.03	1.19
Gov't Factors (SFGS)	SFGS1	5.29	.93	5.51	.70
	SFGS2	5.29	.97	5.56	.69
	SFGS3	4.55	1.51	4.35	1.88
	SFGS4	5.18	1.17	5.29	1.27
	SFGS5	5.71	.56	5.74	.68
	SFGS6	5.74	.57	5.78	.48
	SFGS7	5.72	.55	5.77	.54
NGOs Factors (SFNS)	SFNS1	5.30	.98	5.38	1.00
	SFNS2	4.68	1.50	4.58	1.81
	SFNS3	4.42	1.61	3.94	1.97
	SFNS4	4.98	1.44	4.59	1.88
	SFNS5	5.62	.64	5.67	.84
	SFNS6	5.69	.63	5.74	.47
	SFNS7	5.70	.59	5.74	.55
Intention to be engaged with a	INC1	5.66	.68	5.53	.70
	INC2	5.63	.69	5.55	.67
	INC3	5.62	.63	5.53	.62

cooperative (INC)	INC4	5.65	.58	5.61	.71
	INC5	5.60	.60	5.56	.65
	INC6	5.64	.59	5.70	.58
	INC7	5.69	.56	5.64	.64
Perceived Sustainable Livelihood (PSL)	PSL1	5.35	.70	5.33	.67
	PSL2	5.41	.67	5.37	.61
	PSL3	5.47	.69	5.48	.64
	PSL4	5.51	.64	5.60	.54
	PSL5	5.58	.66	5.61	.57

Appendix 6.2: Assessment of First-Order Reflective Constructs

Table 6.6: Assessment of first-order reflective constructs of fishers

Constructs	**Items**	**Initial items**		**After deleting items**	
		Loading	***t*-value**	**Loading**	***t*-value**
Skill (IFS) *(CR=0.92; AVE= 0.75; α=0.89)*	*IFS1*	0.84	26.46	0.84	26.63
	IFS2	0.86	34.49	0.87	34.78
	IFS3	0.59	7.84	0.59	7.52
	IFS4	0.85	35.19	0.85	36.81
	IFS5	0.86	44.26	0.87	42.50
Experience(IFE) *(CR= 0.95; AVE= 0.86; α=0.92)*	*IFE1*	0.95	120.89	0.96	120.50
	IFE2	0.95	103.39	0.95	98.34
	IFE3	0.86	28.10	0.87	28.10
Involvement(IFI) *(CR=0.95; AVE= 0.82; α=0.93)*	*IFI1*	0.88	27.11	0.88	28.76
	IFI2	0.93	52.44	0.94	49.54
	IFI3	0.93	88.33	0.94	87.02
	IFI4	0.85	15.20	0.86	15.13
Supplier Influences (CFSI) *(CR= 0.97; AVE=0.95; α=0.95)*	*CFSI1*	-0.11	0.771	Deleted	Deleted
	CFSI2	-0.40	3.13	Deleted	Deleted
	CFSI3	-0.45	3.581	Deleted	Deleted
	CFSI4	0.28	2.14	Deleted	Deleted
	CFSI5	0.46	4.66	0.46	4.73
	CFSI6	0.90	34.98	0.95	71.83
	CFSI7	0.89	27.62	0.94	48.11
Vertical Conflict (CFVC) *(CR= 0.93; AVE=0.65; α= 0.91)*	*CFVC1*	0.71	12.77	0.71	12.37
	CFVC2	0.80	20.28	0.81	20.34
	CFVC3	0.84	26.91	0.85	26.06
	CFVC4	0.87	43.01	0.87	42.07
	CFVC5	0.88	36.18	0.89	36.33
	CFVC6	0.84	26.13	0.84	26.27
	CFVC7	0.62	12.17	0.62	12.14
Horizontal Competition	*CFHC1*	0.92	2.10	0.95	2.92
	CFHC2	0.93	2.11	0.94	2.90

(CR= 0.94; AVE= 0.89; α=0.88)	*CFHC3*	0.27	0.75	Deleted	Deleted
More Income *(CR=0.94; AVE= 0.71; α=0.92)*	*PBCMI1*	0.86	43.62	0.87	41.90
	PBCMI2	0.81	12.20	0.82	11.82
	PBCMI3	0.88	51.41	0.89	49.72
	PBCMI4	0.88	52.64	0.89	54.29
	PBCMI5	0.81	23.73	0.81	23.10
	PBCMI6	0.79	22.62	0.80	22.70
Alternative Income *(CR=0.88; AVE=0.64; α=0.81)*	*PBCAI1*	0.70	13.97	0.71	14.92
	PBCAI2	0.87	42.89	0.87	45.72
	PBCAI3	0.85	34.19	0.86	35.94
	PBCAI4	0.76	19.77	0.76	20.35
Compatibility *(CR=0.70; AVE=0.57; α =0.36)*	*PBCC1*	0.42	1.64	0.46	2.90
	PBCC2	0.34	1.29	Deleted	Deleted
	PBCC3	0.97	16.90	0.97	31.49
Dishonesty of Leaders *(CR=0.98; AVE=0.91; α=0.97)*	*PBDL1*	0.92	1.14	0.93	1.72
	PBDL2	0.97	1.14	0.97	1.72
	PBDL3	0.96	1.12	0.97	1.71
	PBDL4	0.94	1.14	0.94	1.71
Lack of Trust *(CR= 0.82; AVE= 0.53; α=0.71)*	*PBLT1*	0.54	3.70	Deleted	Deleted
	PBLT2	0.72	4.32	0.71	3.21
	PBLT3	0.60	4.78	0.63	3.90
	PBLT4	0.80	6.27	0.85	5.11
	PBLT5	0.72	4.15	0.71	3.08
Lack of Unity *(CR= 0.90; AVE=0.59; α=0.86)*	*PBLU1*	0.84	14.10	0.87	9.94
	PBLU2	0.87	14.15	0.90	10.15
	PBLU3	0.87	13.52	0.90	10.01
	PBLU4	0.66	7.70	0.67	6.14
	PBLU5	0.64	7.91	0.62	5.78
	PBLU6	0.39	2.92	Deleted	Deleted
	PBLU7	0.63	6.90	0.59	5.45
Peer Influence *(CR=0.96; AVE=0.92; α=0.91)*	*SIPI1*	0.60	6.33	0.60	6.21
	SIPI2	0.89	34.06	0.90	32.95
	SIPI3	0.84	16.40	0.84	16.36
	SIPI4	0.70	10.19	0.70	10.06
Family Influence *(CR= 0.96 AVE= 0.89; α = 0.94)*	*SIFI1*	0.95	151.05	0.96	142.04
	SIFI2	0.93	44.35	0.93	42.23
	SIFI3	0.94	49.66	0.94	51.51
Gov't Support *(CR=0.87; AVE= 0.58; α=0.82)*	*SFGS1*	0.75	17.11	0.77	18.09
	SFGS2	0.65	10.49	0.70	12.12
	SFGS3	0.48	6.25	Deleted	Deleted
	SFGS4	0.57	7.96	Deleted	Deleted

	SFGS5	0.80	24.04	0.84	26.73
	SFGS6	0.73	9.69	0.77	12.54
	SFGS7	0.69	11.76	0.73	13.00
NGO Support *(CR = 0.89; AVE = 0.72; α = 0.81)*	*SFNS1*	0.57	12.75	Deleted	Deleted
	SFNS2	0.67	9.92	Deleted	Deleted
	SFNS3	0.56	6.65	Deleted	Deleted
	SFNS4	0.61	8.95	Deleted	Deleted
	SFNS5	0.69	11.52	0.84	22.68
	SFNS6	0.68	10.30	0.90	35.99
	SFNS7	0.61	7.30	0.81	15.69
Attitude (*CR = 0.90; AVE = 0.70; α = 0.85*)	*ATC1*	0.89	47.47	0.90	48.17
	ATC2	0.87	20.86	0.88	21.90
	ATC3	0.81	15.31	0.81	15.87
	ATC4	0.52	7.75	0.52	7.49
	ATC5	0.69	11.14	0.70	11.55
Intention to be engaged with a fishers' cooperative *(CR = 0.93; AVE = 0.66; α = 0.91)*	*INC1*	0.76	13.38	0.76	13.62
	INC2	0.77	14.42	0.77	14.05
	INC3	0.82	24.89	0.83	25.51
	INC4	0.84	26.07	0.85	25.33
	INC5	0.82	23.96	0.82	23.63
	INC6	0.83	25.15	0.84	26.26
	INC7	0.81	18.25	0.82	19.13
Perceived sustainable livelihood *(CR = 0.93; AVE= 0.72; α = 0.90)*	*PSL1*	0.87	48.12	0.88	48.42
	PSL2	0.87	42.01	0.87	42.67
	PSL3	0.82	23.92	0.83	25.28
	PSL4	0.84	30.57	0.85	30.50
	PSL5	0.81	24.78	0.82	25.75

Appendix 6.3: Assessment of Loadings and *t*-values for First-Order Reflective Constructs of Suppliers

Table 6.7: Assessment of loadings and *t*-values for the first-order reflective constructs of suppliers

Constructs	***Items***	**Initial items**		**After deleting items**	
		Loading	***t*-value**	**Loading**	***t*-value**
Skill *(CR=0.90; AVE=0.64; α=0.86)*	*IFS1*	0.86	14.91	0.86	16.54
	IFS2	0.80	9.90	0.80	9.91
	IFS3	0.65	7.60	0.65	7.68
	IFS4	0.86	25.43	0.86	25.58
	IFS5	0.82	10.53	0.82	10.74
Experience *(CR=0.92; AVE=0.80; α = 0.87)*	*IFE1*	0.92	40.82	0.92	40.60
	IFE2	0.86	22.72	0.89	22.48
	IFE3	0.87	17.04	0.87	17.54
Involvement *(CR=0.96;*	*IFI1*	0.92	29.66	0.92	28.25
	IFI2	0.91	27.21	0.91	25.99

AVE=0.86; *α=0.95)*	*IFI3*	0.93	34.47	0.93	34.42
	IFI4	0.95	41.80	0.95	41.16
Supplier Influences *(CR=0.80; AVE=0.57; α=0.66)*	*CFSI1*	-0.33	2.05	Deleted	Deleted
	CFSI2	-0.36	1.78	Deleted	Deleted
	CFSI3	-0.33	1.58	Deleted	Deleted
	CFSI4	0.54	3.17	Deleted	Deleted
	CFSI5	0.78	13.43	0.81	17.97
	CFSI6	0.60	4.85	0.69	5.71
	CFSI7	0.72	7.72	0.76	7.42
Vertical Conflict *(CR=0.91; AVE=0.66; α=0.87)*	*CFVC1*	0.71	9.66	0.71	9.84
	CFVC2	0.68	5.84	0.68	7.08
	CFVC3	-0.05	0.30	Deleted	Deleted
	CFVC4	0.86	21.98	0.87	26.63
	CFVC5	0.90	30.77	0.89	31.96
	CFVC6	0.89	24.72	0.89	26.55
	CFVC7	0.34	2.25	Deleted	Deleted
Horizontal Competition *(CR=0.77; AVE=0.63; α=0.51)*	*CFHC1*	-0.37	0.64	Deleted	Deleted
	CFHC2	-0.62	0.948	0.59	1.12
	CFHC3	-0.94	1.33	0.96	1.14
More Income *(CR=0.92; AVE=0.69; α=0.89)*	*PBCMI1*	0.83	18.75	0.84	19.65
	PBCMI2	0.78	16.60	0.80	19.60
	PBCMI3	0.87	27.87	0.87	29.57
	PBCMI4	0.85	24.08	0.85	23.03
	PBCMI5	0.82	18.81	0.81	17.79
	PBCMI6	0.28	1.60	Deleted	Deleted
Alternative Income *(CR=0.88; AVE=0.65; α=0.82)*	*PBCAI1*	0.76	10.95	0.75	10.42
	PBCAI2	0.84	22.64	0.84	22.83
	PBCAI3	0.83	19.35	0.83	19.11
	PBCAI4	0.80	20.18	0.81	21.40
Compatibility *(CR=1.00; AVE=1.00; α=1.00)*	*PBCC1*	-0.41	1.26	Deleted	Deleted
	PBCC2	-0.78	3.00	Deleted	Deleted
	PBCC3	0.63	2.73	1.00	0.00
Dishonesty of Leaders *(CR=0.98; AVE=0.92; α=0.97)*	*PBDL1*	0.91	18.19	0.91	19.56
	PBDL2	0.98	268.20	0.98	258.89
	PBDL3	0.97	106.43	0.97	102.32
	PBDL4	0.97	132.07	0.97	138.17
Lack of Trust *(CR=0.85; AVE=0.59; α=0.78)*	*PBLT1*	0.78	14.75	0.74	11.84
	PBLT2	0.68	6.81	0.76	8.31
	PBLT3	0.63	6.28	Deleted	Deleted
	PBLT4	0.69	6.86	0.75	8.12
	PBLT5	0.72	10.07	0.81	16.54
Lack of Unity *(CR=0.93; AVE=0.69; α=0.90)*	*PBLU1*	0.83	16.17	0.82	14.27
	PBLU2	0.89	25.83	0.91	29.56
	PBLU3	0.92	36.47	0.92	35.33
	PBLU4	0.90	26.43	0.91	24.71
	PBLU5	0.89	33.17	0.89	32.63

	PBLU6	0.38	3.24	Deleted	Deleted
	PBLU7	0.46	3.92	0.46	4.17
Peer Influence *(CR=0.90; AVE=0.70; α=0.84)*	*SIPI1*	0.49	2.51	0.49	2.40
	SIPI2	0.96	66.24	0.96	68.39
	SIPI3	0.92	33.72	0.92	33.26
	SIPI4	0.91	28.24	0.91	28.91
Family Influence *(CR=0.95; AVE=0.87; α=0.92)*	*SIFI1*	0.92	14.26	0.92	14.42
	SIFI2	0.95	4.28	0.95	14.34
	SIFI3	0.92	13.66	0.92	13.95
Gov't Support *(CR=0.87; AVE=0.58; α=0.82)*	*SFGS1*	0.67	2.87	0.72	13.53
	SFGS2	0.75	3.16	0.80	18.25
	SFGS3	0.26	1.02	Deleted	Deleted
	SFGS4	0.53	3.20	Deleted	Deleted
	SFGS5	0.65	3.92	0.63	3.06
	SFGS6	0.81	5.12	0.81	16.41
	SFGS7	0.78	4.81	0.79	14.07
NGO Support *(CR=0.97; AVE=0.94; α=0.93)*	*SFNS1*	0.45	2.79	Deleted	Deleted
	SFNS2	0.69	1.71	Deleted	Deleted
	SFNS3	0.59	1.342	Deleted	Deleted
	SFNS4	0.63	1.44	Deleted	Deleted
	SFNS5	0.44	2.10	Deleted	Deleted
	SFNS6	0.73	3.48	0.97	54.84
	SFNS7	0.66	3.19	0.97	65.28
Attitude towards a Fishers' Cooperative *(CR=0.87; AVE=0.58; α=0.82)*	*ATC1*	0.88	33.88	0.88	32.13
	ATC2	0.91	48.88	0.91	48.95
	ATC3	0.66	7.42	0.66	7.47
	ATC4	0.57	6.32	0.57	6.56
	ATC5	0.74	15.86	0.74	15.26
Intention to be Engaged with a Fishers' Cooperative *(CR=0.94; AVE=0.69; α=0.93)*	*INC1*	0.76	7.73	0.76	7.85
	INC2	0.85	13.03	0.84	12.91
	INC3	0.77	13.06	0.77	13.14
	INC4	0.90	14.55	0.91	13.92
	INC5	0.82	8.01	0.82	7.73
	INC6	0.84	8.28	0.85	8.17
	INC7	0.86	10.77	0.87	10.95
Perceived Sustainable Livelihood *(CR=0.87; AVE=0.57; α=0.82)*	*PSL1*	0.66	6.34	0.66	6.88
	PSL2	0.76	9.54	0.76	10.88
	PSL3	0.80	7.14	0.80	7.58
	PSL4	0.83	10.12	0.83	11.35
	PSL5	0.72	8.75	0.72	8.53

* Items deleted due to low loading (<0.45)

Appendix 6.4: Cross-Loading Matrix for Fishers' Data

Table 6.10: Cross-Loading Matrix for Fishers' Data

	ATC	CFHC	CFSI	CFVC	IFE	IFI	IFS	INC	PBCAI	PBCC	PBCMI	PBDL	PBLT	PBLU	PSL	SFGS	SFNS	SIFI	SIPI
ATC1	0.921	0.168	-0.032	0.087	0.043	0.152	0.153	0.467	0.594	0.180	0.651	0.149	-0.032	0.196	0.428	0.406	0.333	0.090	0.117
ATC2	0.886	0.118	-0.048	0.118	0.085	0.151	0.209	0.439	0.538	0.237	0.598	0.099	0.062	0.195	0.406	0.366	0.303	0.028	0.086
ATC3	0.819	0.137	0.034	0.191	-0.034	0.127	0.073	0.327	0.500	0.253	0.528	0.144	0.062	0.261	0.306	0.391	0.297	0.162	0.176
ATC5	0.701	0.052	-0.027	0.030	0.087	0.200	0.213	0.295	0.409	0.296	0.511	-0.057	0.149	0.216	0.256	0.280	0.248	0.008	0.049
CFHC1	0.121	0.945	0.206	0.088	0.145	-0.046	-0.052	-0.086	0.238	-0.013	0.236	0.511	-0.149	0.011	0.059	0.023	-0.041	-0.026	-0.113
CFHC2	0.155	0.943	0.253	0.069	0.146	-0.074	-0.050	-0.082	0.252	-0.063	0.283	0.577	-0.198	-0.001	0.023	-0.002	-0.053	-0.118	-0.125
CFSI6	-0.023	0.231	0.971	0.576	0.216	0.021	-0.042	-0.079	0.053	-0.075	-0.016	0.227	0.401	0.158	0.008	0.091	0.065	-0.009	-0.065
CFSI7	-0.023	0.241	0.973	0.606	0.167	0.051	-0.019	-0.071	0.066	-0.074	-0.008	0.217	0.377	0.186	-0.017	0.086	0.051	-0.001	-0.072
CFVC1	0.287	0.134	0.338	0.712	0.123	0.233	0.138	0.200	0.310	0.216	0.306	0.079	0.378	0.345	0.291	0.299	0.335	0.080	-0.030
CFVC2	0.094	-0.047	0.453	0.809	0.043	0.189	0.065	0.054	0.176	0.141	0.157	0.066	0.408	0.396	0.157	0.176	0.227	0.141	0.094
CFVC3_RAdj	0.056	0.040	0.687	0.849	0.066	0.135	0.031	-0.031	0.125	0.107	0.065	0.033	0.471	0.311	0.069	0.142	0.153	0.103	0.073
CFVC4	0.089	0.041	0.480	0.870	0.089	0.158	0.075	0.069	0.162	0.235	0.143	0.036	0.488	0.388	0.182	0.213	0.186	0.144	0.080
CFVC5	0.220	0.079	0.494	0.884	0.079	0.138	0.048	0.126	0.235	0.176	0.208	0.137	0.401	0.417	0.210	0.230	0.232	0.154	0.080
CFVC6	0.163	0.057	0.394	0.843	0.012	0.060	-0.014	0.059	0.222	0.223	0.189	0.128	0.361	0.394	0.182	0.263	0.209	0.205	0.144
CFVC7	-0.224	0.200	0.566	0.625	0.180	0.023	-0.049	-0.152	-0.006	-0.005	-0.078	0.196	0.313	0.135	-0.087	-0.150	-0.054	-0.059	-0.098
IFE1	0.049	0.120	0.146	0.089	0.957	0.574	0.705	0.225	0.208	0.149	0.178	0.053	0.049	0.016	0.197	0.099	0.032	-0.128	-0.101
IFE2	0.046	0.128	0.159	0.105	0.951	0.607	0.701	0.260	0.214	0.165	0.214	0.049	0.046	0.044	0.209	0.099	0.032	-0.122	-0.081
IFE3	0.056	0.185	0.248	0.085	0.865	0.542	0.605	0.174	0.195	0.047	0.158	0.133	0.071	0.024	0.152	0.089	0.010	-0.126	-0.136
IFI1	0.160	-0.120	-0.005	0.100	0.602	0.883	0.747	0.371	0.263	0.210	0.237	-0.115	0.134	0.112	0.302	0.188	0.139	-0.065	-0.031
IFI2	0.154	-0.033	0.027	0.142	0.555	0.936	0.728	0.317	0.324	0.252	0.260	-0.056	0.133	0.155	0.260	0.199	0.115	0.011	-0.015
IFI3	0.164	-0.110	-0.003	0.133	0.556	0.938	0.743	0.353	0.275	0.269	0.261	-0.118	0.155	0.183	0.263	0.210	0.155	-0.006	0.004

IFI4	0.195	0.043	0.124	0.237	0.533	0.858	0.628	0.397	0.378	0.205	0.338	0.073	0.123	0.277	0.352	0.274	0.209	0.036	0.032
IFS1	0.128	-0.063	-0.067	0.015	0.536	0.640	0.844	0.292	0.234	0.126	0.172	0.039	0.097	0.160	0.211	0.144	0.064	-0.014	0.025
IFS2	0.180	-0.035	-0.018	0.036	0.618	0.703	0.870	0.311	0.278	0.161	0.236	0.011	0.039	0.097	0.221	0.112	0.094	-0.046	0.011
IFS4	0.187	-0.075	-0.077	0.050	0.597	0.700	0.871	0.475	0.347	0.227	0.339	-0.098	0.045	0.106	0.323	0.284	0.151	-0.029	0.031
IFS5	0.169	-0.016	0.046	0.077	0.750	0.685	0.875	0.429	0.309	0.219	0.296	-0.004	0.092	0.115	0.325	0.261	0.162	-0.038	0.006
INC1	0.382	-0.077	-0.101	-0.004	0.159	0.226	0.272	0.761	0.396	0.130	0.423	-0.049	0.083	0.187	0.470	0.346	0.248	0.059	0.075
INC2	0.372	-0.077	-0.107	0.020	0.208	0.296	0.376	0.774	0.388	0.152	0.424	-0.030	0.076	0.214	0.487	0.362	0.243	0.087	0.092
INC3	0.373	-0.135	-0.032	0.099	0.207	0.324	0.348	0.827	0.418	0.247	0.440	-0.091	0.136	0.236	0.452	0.482	0.332	0.146	0.151
INC4	0.376	-0.068	-0.027	0.106	0.182	0.296	0.316	0.847	0.447	0.237	0.470	-0.068	0.121	0.218	0.509	0.465	0.342	0.079	0.098
INC5	0.381	-0.076	-0.046	0.116	0.116	0.297	0.330	0.820	0.416	0.249	0.415	-0.091	0.124	0.207	0.583	0.380	0.386	0.208	0.255
INC6	0.428	-0.019	-0.053	0.012	0.269	0.417	0.453	0.837	0.389	0.152	0.438	-0.058	0.104	0.223	0.517	0.429	0.330	0.129	0.139
INC7	0.328	-0.058	-0.081	-0.021	0.222	0.390	0.388	0.816	0.334	0.136	0.348	-0.055	0.096	0.210	0.521	0.390	0.245	0.081	0.087
PBCAI1	0.400	0.351	0.141	0.107	0.236	0.221	0.212	0.370	0.708	0.135	0.520	0.375	-0.075	0.124	0.352	0.261	0.151	-0.011	-0.003
PBCAI2	0.475	0.292	0.065	0.140	0.202	0.283	0.320	0.416	0.874	0.274	0.589	0.278	-0.008	0.226	0.506	0.313	0.248	0.116	0.148
PBCAI3	0.582	0.098	-0.034	0.177	0.137	0.337	0.335	0.439	0.855	0.355	0.640	0.126	0.080	0.287	0.497	0.450	0.333	0.179	0.258
PBCAI4	0.506	0.119	0.045	0.271	0.150	0.243	0.208	0.347	0.760	0.474	0.599	0.089	0.112	0.220	0.383	0.438	0.304	0.075	0.129
PBCC1	-0.087	-0.080	0.017	0.152	0.006	0.132	0.079	0.073	0.183	0.457	0.051	-0.112	0.022	0.221	0.209	0.024	0.025	0.433	0.432
PBCC3	0.332	-0.021	-0.089	0.174	0.144	0.248	0.212	0.233	0.380	0.968	0.346	-0.103	0.121	0.251	0.227	0.214	0.133	0.113	0.088
PBCMI1	0.704	0.153	-0.028	0.128	0.095	0.229	0.227	0.505	0.655	0.280	0.865	0.177	0.045	0.309	0.511	0.407	0.308	0.088	0.207
PBCMI2	0.566	0.173	-0.063	0.074	0.173	0.258	0.285	0.397	0.578	0.216	0.817	0.171	-0.028	0.231	0.438	0.339	0.257	0.028	0.212
PBCMI3	0.601	0.264	-0.123	0.045	0.177	0.239	0.268	0.449	0.613	0.247	0.885	0.212	-0.032	0.246	0.410	0.317	0.260	0.027	0.119
PBCMI4	0.615	0.253	-0.037	0.165	0.123	0.282	0.237	0.521	0.662	0.328	0.888	0.240	0.029	0.322	0.540	0.444	0.347	0.095	0.177
PBCMI5	0.502	0.271	0.079	0.238	0.225	0.233	0.252	0.386	0.583	0.314	0.812	0.320	0.100	0.266	0.387	0.383	0.330	0.087	0.103
PBCMI6	0.489	0.279	0.122	0.260	0.225	0.288	0.274	0.370	0.628	0.279	0.799	0.360	0.176	0.344	0.393	0.410	0.310	0.086	0.106
PBDL1	0.141	0.564	0.198	0.092	0.075	-0.048	-0.017	-0.056	0.248	-0.092	0.286	0.929	-0.080	0.111	0.109	0.131	0.127	0.010	-0.009
PBDL2	0.124	0.554	0.214	0.117	0.073	-0.070	-0.024	-0.075	0.236	-0.117	0.294	0.972	-0.106	0.134	0.124	0.166	0.123	0.058	0.057

PBDL3	0.082	0.552	0.215	0.103	0.082	-0.031	0.003	-0.083	0.265	-0.118	0.259	0.967	-0.138	0.108	0.104	0.158	0.121	0.028	0.001
PBDL4	0.066	0.522	0.243	0.129	0.085	-0.089	-0.023	-0.084	0.247	-0.141	0.265	0.940	-0.092	0.121	0.116	0.173	0.118	0.075	0.051
PBLT2_RAdj	0.171	-0.135	0.311	0.414	0.069	0.097	0.061	0.148	0.046	0.085	0.108	-0.069	0.705	0.210	0.085	0.152	0.269	0.026	-0.021
PBLT3	-0.055	-0.171	0.241	0.277	0.095	0.110	0.069	0.114	0.033	0.049	-0.020	-0.119	0.635	0.309	0.009	0.023	-0.020	-0.010	-0.021
PBLT4_RAdj	-0.002	-0.052	0.358	0.403	0.012	0.115	0.047	0.056	0.055	0.133	0.077	0.004	0.855	0.429	0.033	0.091	0.095	0.016	-0.026
PBLT5_RAdj	0.112	-0.237	0.244	0.391	0.018	0.125	0.062	0.098	-0.034	0.050	-0.018	-0.192	0.707	0.281	0.064	0.090	0.288	0.108	0.075
PBLU1	0.243	0.065	0.221	0.378	0.013	0.122	0.045	0.174	0.226	0.237	0.256	0.129	0.388	0.866	0.195	0.135	0.155	0.305	0.356
PBLU2	0.207	0.034	0.147	0.389	0.034	0.200	0.124	0.206	0.234	0.303	0.284	0.135	0.322	0.897	0.234	0.207	0.200	0.346	0.338
PBLU3	0.178	0.046	0.159	0.378	0.009	0.128	0.085	0.211	0.227	0.187	0.321	0.180	0.330	0.905	0.235	0.201	0.206	0.377	0.393
PBLU4	0.259	-0.140	-0.056	0.196	0.006	0.133	0.156	0.254	0.172	0.200	0.253	-0.026	0.104	0.672	0.242	0.195	0.202	0.279	0.382
PBLU5	0.222	-0.024	0.059	0.253	0.041	0.177	0.138	0.225	0.248	0.217	0.313	0.073	0.325	0.619	0.222	0.251	0.259	0.031	0.149
PBLU7	0.087	-0.021	0.241	0.352	0.046	0.176	0.127	0.177	0.146	0.172	0.134	0.024	0.548	0.593	0.208	0.038	0.123	0.031	0.087
PSL1	0.390	0.016	-0.080	0.086	0.175	0.270	0.308	0.577	0.506	0.174	0.446	0.082	0.027	0.221	0.876	0.441	0.403	0.219	0.291
PSL2	0.395	0.103	-0.066	0.132	0.181	0.266	0.291	0.559	0.501	0.182	0.471	0.114	0.037	0.222	0.872	0.401	0.413	0.206	0.281
PSL3	0.261	-0.009	-0.004	0.121	0.163	0.339	0.262	0.448	0.400	0.228	0.379	0.057	-0.007	0.233	0.828	0.387	0.285	0.288	0.362
PSL4	0.391	0.057	0.074	0.202	0.224	0.254	0.276	0.526	0.487	0.255	0.494	0.132	0.085	0.253	0.845	0.519	0.350	0.203	0.182
PSL5	0.346	0.011	0.068	0.232	0.113	0.254	0.189	0.519	0.408	0.278	0.448	0.115	0.111	0.281	0.816	0.493	0.466	0.231	0.169
SFGS1	0.522	0.128	0.066	0.182	0.047	0.183	0.199	0.424	0.536	0.193	0.525	0.200	0.063	0.249	0.428	0.766	0.360	0.209	0.263
SFGS2	0.461	0.162	0.030	0.164	0.049	0.155	0.174	0.348	0.475	0.167	0.516	0.231	0.116	0.255	0.384	0.700	0.330	0.089	0.095
SFGS5	0.244	0.023	0.021	0.135	0.081	0.193	0.164	0.368	0.318	0.168	0.259	0.129	0.063	0.122	0.378	0.839	0.457	0.246	0.128
SFGS6	0.180	-0.130	0.142	0.164	0.047	0.111	0.086	0.335	0.181	0.061	0.152	0.001	0.106	0.058	0.321	0.773	0.374	0.214	0.176
SFGS7	0.264	-0.136	0.093	0.180	0.172	0.271	0.270	0.444	0.256	0.176	0.300	0.073	0.111	0.168	0.514	0.725	0.414	0.122	0.079
SFNS5	0.318	0.006	0.041	0.206	0.037	0.143	0.142	0.291	0.303	0.119	0.291	0.112	0.097	0.175	0.392	0.407	0.841	0.298	0.214
SFNS6	0.278	-0.082	0.047	0.166	-0.020	0.097	0.062	0.269	0.245	0.067	0.302	0.106	0.183	0.219	0.338	0.482	0.897	0.261	0.144
SFNS7	0.312	-0.045	0.065	0.224	0.057	0.198	0.155	0.409	0.294	0.146	0.319	0.110	0.223	0.225	0.439	0.405	0.807	0.202	0.079
SIFI1	0.077	-0.071	-0.030	0.121	-0.163	-0.031	-0.063	0.121	0.108	0.188	0.085	0.025	0.034	0.293	0.264	0.216	0.276	0.959	0.771

SIFI2	0.082	-0.081	-0.039	0.106	-0.089	0.028	0.008	0.149	0.110	0.188	0.053	0.031	0.014	0.255	0.226	0.212	0.305	0.929	0.622
SIFI3	0.088	-0.065	0.053	0.176	-0.128	-0.015	-0.047	0.132	0.118	0.229	0.090	0.073	0.073	0.342	0.267	0.236	0.268	0.943	0.746
SIPI2	0.132	-0.118	-0.068	0.073	-0.097	0.003	0.022	0.172	0.184	0.165	0.186	0.008	-0.030	0.405	0.300	0.190	0.149	0.709	0.958
SIPI3	0.115	-0.123	-0.067	0.058	-0.120	-0.009	0.018	0.138	0.151	0.201	0.165	0.044	0.024	0.321	0.277	0.184	0.179	0.744	0.960

*******The following five (5) additional items are deleted due to their cross-loading: ATC4, CFSI5, IFS3, SIPI1 and SIPI4.

Appendix 6.5: Cross-Loading Matrix for Suppliers' Data

Table 6.11: Cross-Loading Matrix for Suppliers' Data

	ATC	CFHC	CFSI	CFVC	IFE	IFI	IFS	INC	PBCAI	PBCC	PBCMI	PBDL	PBLT	PBLU	PSL	SFGS	SFNS	SIFI	SIPI
ATC1	0.877	-0.305	0.333	0.414	0.021	0.002	-0.052	0.352	0.570	0.154	0.591	0.007	0.224	0.392	0.434	0.487	0.094	0.015	0.159
ATC2	0.924	-0.206	0.306	0.423	0.106	0.113	0.082	0.371	0.613	0.151	0.680	0.036	0.207	0.407	0.547	0.464	0.134	-0.004	0.260
ATC3	0.654	-0.142	0.140	0.324	0.151	0.130	0.170	0.220	0.412	0.205	0.353	-0.072	0.012	0.298	0.332	0.163	0.070	-0.003	0.248
ATC5	0.764	-0.093	0.067	0.194	0.200	0.230	0.282	0.380	0.529	0.335	0.651	-0.155	-0.012	0.233	0.341	0.183	0.279	-0.102	0.165
CFHC2	-0.055	0.584	-0.019	-0.077	0.090	-0.076	0.061	-0.008	-0.049	-0.016	-0.049	0.345	-0.083	0.180	0.100	-0.186	-0.124	0.070	0.171
CFHC3	-0.253	0.962	-0.087	-0.197	-0.041	-0.108	-0.043	0.087	-0.129	0.009	-0.088	0.305	-0.162	-0.045	-0.273	-0.169	0.026	0.172	-0.114
CFSI5	0.408	-0.187	0.809	0.759	0.003	0.049	-0.043	0.129	0.239	0.056	0.239	0.313	0.340	0.571	0.229	0.235	0.002	0.179	0.311
CFSI6	-0.103	0.121	0.693	0.271	-0.182	-0.083	-0.191	-0.075	-0.147	-0.079	-0.112	0.275	0.278	0.183	-0.075	-0.087	-0.213	0.253	0.218
CFSI7	0.125	0.001	0.759	0.412	-0.079	-0.133	-0.142	0.057	0.050	0.107	0.135	0.213	0.214	0.365	0.073	0.081	-0.071	0.121	0.284
CFVC1	0.469	-0.265	0.491	0.707	0.181	0.268	0.190	0.107	0.273	0.241	0.270	0.289	0.151	0.316	0.137	0.298	0.091	-0.036	-0.019
CFVC2	0.291	-0.021	0.559	0.683	-0.242	-0.164	-0.302	0.162	0.229	-0.092	0.349	0.334	0.425	0.518	0.230	0.240	-0.054	0.060	0.345
CFVC4	0.285	-0.219	0.635	0.871	-0.038	0.028	-0.013	0.208	0.244	0.191	0.189	0.250	0.315	0.473	0.236	0.173	-0.001	0.178	0.337
CFVC5	0.359	-0.129	0.584	0.889	0.000	0.051	0.056	0.138	0.227	0.182	0.229	0.278	0.289	0.496	0.140	0.146	0.055	0.004	0.096
CFVC6	0.323	-0.148	0.614	0.896	-0.161	-0.062	-0.117	0.158	0.215	0.205	0.226	0.314	0.408	0.641	0.247	0.161	0.081	0.055	0.286
IFE1	0.055	0.055	-0.102	-0.086	0.921	0.737	0.679	0.034	0.054	0.088	0.033	0.036	-0.116	0.002	0.082	0.068	-0.014	0.090	-0.093
IFE2	0.174	-0.037	-0.099	-0.025	0.884	0.718	0.764	0.084	0.097	0.074	0.109	0.007	0.014	0.114	0.078	0.210	0.135	0.083	-0.078
IFE3	0.149	-0.049	-0.009	-0.066	0.874	0.563	0.620	0.074	0.090	0.051	0.111	-0.023	-0.094	0.038	0.170	0.168	0.033	-0.097	-0.100

IFI1	0.084	-0.067	-0.030	0.010	0.694	0.918	0.685	0.151	0.015	0.050	0.102	-0.115	-0.037	0.045	0.048	0.096	0.093	0.243	-0.056
IFI2	0.102	-0.170	-0.102	-0.056	0.622	0.910	0.677	0.145	0.114	0.024	0.141	-0.150	-0.012	-0.052	0.100	0.128	0.062	-0.005	-0.022
IFI3	0.154	-0.079	-0.062	0.087	0.736	0.931	0.779	0.157	0.138	0.130	0.167	0.003	0.063	0.123	0.104	0.198	0.136	0.024	-0.037
IFI4	0.177	-0.116	0.018	0.050	0.753	0.946	0.743	0.186	0.106	0.085	0.197	-0.080	-0.013	0.091	0.168	0.208	0.122	0.037	-0.002
IFS1	0.018	0.020	-0.117	0.049	0.587	0.704	0.852	0.043	0.038	0.159	0.067	0.012	-0.083	0.025	-0.014	-0.075	0.065	0.043	-0.051
IFS2	0.124	0.094	-0.006	0.047	0.618	0.603	0.826	0.062	0.062	0.241	0.091	0.039	-0.119	0.082	-0.005	-0.006	0.026	0.024	-0.040
IFS4	0.150	-0.091	-0.141	-0.084	0.706	0.763	0.869	0.093	0.083	0.174	0.113	-0.165	-0.100	-0.002	0.077	0.116	0.096	0.028	-0.057
IFS5	0.173	-0.079	-0.198	-0.156	0.703	0.553	0.834	0.067	0.084	0.127	0.137	-0.167	-0.132	-0.035	0.135	0.118	0.132	-0.123	-0.078
INC1	0.351	-0.046	0.068	0.225	0.126	0.173	0.084	0.762	0.216	0.185	0.265	-0.137	0.102	0.182	0.367	0.339	0.175	0.138	0.188
INC2	0.381	0.039	0.101	0.208	0.075	0.124	0.004	0.844	0.274	0.367	0.287	-0.176	0.063	0.117	0.401	0.270	0.176	0.118	0.281
INC3	0.369	0.040	0.071	0.192	0.012	0.133	0.076	0.773	0.266	0.333	0.347	-0.108	0.023	0.123	0.377	0.232	0.161	0.041	0.195
INC4	0.364	0.125	0.054	0.148	0.034	0.153	0.034	0.904	0.272	0.256	0.352	-0.153	0.089	0.229	0.417	0.152	0.084	0.216	0.305
INC5	0.294	0.049	-0.072	0.003	0.090	0.136	0.175	0.823	0.212	0.220	0.293	-0.167	-0.042	0.139	0.383	0.140	0.030	0.204	0.273
INC6	0.327	0.081	0.108	0.179	0.058	0.132	0.016	0.844	0.278	0.289	0.374	-0.100	0.093	0.256	0.481	0.216	0.082	0.269	0.299
INC7	0.332	0.122	0.121	0.146	0.023	0.157	0.090	0.865	0.251	0.305	0.353	-0.072	0.032	0.241	0.397	0.264	0.147	0.230	0.308
PBCAI1	0.380	0.109	0.011	0.089	0.002	-0.084	-0.048	0.183	0.753	0.179	0.538	-0.015	-0.045	0.178	0.220	0.100	0.042	-0.151	0.090
PBCAI2	0.536	-0.029	0.031	0.173	0.050	0.109	0.112	0.280	0.844	0.271	0.677	-0.109	-0.050	0.221	0.267	0.201	0.081	-0.104	0.077
PBCAI3	0.574	-0.265	0.124	0.293	0.136	0.206	0.065	0.222	0.826	0.044	0.619	-0.103	0.247	0.241	0.396	0.286	0.211	0.007	0.081
PBCAI4	0.629	-0.197	0.226	0.361	0.094	0.076	0.110	0.290	0.805	0.193	0.675	-0.046	0.173	0.293	0.462	0.366	0.062	-0.027	0.185
PBCC3	0.253	0.003	0.053	0.185	0.081	0.080	0.207	0.337	0.214	1.000	0.204	-0.140	-0.265	0.101	0.102	0.053	0.031	-0.046	0.063
PBCMI1	0.773	-0.252	0.207	0.390	0.085	0.167	0.135	0.394	0.712	0.210	0.835	-0.072	0.104	0.349	0.442	0.449	0.166	-0.095	0.132
PBCMI2	0.647	-0.161	0.193	0.350	0.120	0.142	0.107	0.357	0.576	0.203	0.794	-0.079	0.117	0.242	0.407	0.336	0.078	-0.040	0.100
PBCMI3	0.509	-0.043	0.109	0.182	0.068	0.189	0.087	0.325	0.668	0.092	0.870	-0.048	0.205	0.298	0.367	0.264	0.004	-0.007	0.130
PBCMI4	0.559	-0.019	0.101	0.159	0.056	0.064	0.092	0.280	0.652	0.161	0.848	-0.051	0.123	0.309	0.411	0.285	0.109	-0.053	0.143

PBCMI5	0.495	0.109	0.088	0.178	0.060	0.124	0.079	0.270	0.632	0.186	0.812	0.095	-0.023	0.269	0.339	0.251	0.087	-0.049	0.037
PBDL1	-0.050	0.364	0.261	0.316	-0.035	-0.130	-0.087	-0.117	-0.013	-0.143	-0.052	0.911	0.221	0.361	-0.017	0.058	0.107	-0.001	0.058
PBDL2	-0.024	0.339	0.365	0.343	0.049	-0.077	-0.068	-0.156	-0.092	-0.137	-0.019	0.983	0.279	0.444	-0.040	0.173	0.004	-0.003	0.043
PBDL3	-0.036	0.371	0.358	0.356	0.007	-0.083	-0.086	-0.146	-0.083	-0.128	-0.031	0.969	0.231	0.459	-0.049	0.172	-0.019	0.011	0.058
PBDL4	-0.077	0.322	0.375	0.349	0.008	-0.063	-0.090	-0.174	-0.138	-0.133	-0.047	0.968	0.309	0.445	-0.023	0.143	-0.023	-0.030	0.060
PBLT1	0.123	0.119	0.358	0.340	-0.137	-0.077	-0.196	0.110	0.042	-0.251	0.148	0.337	0.731	0.592	0.262	0.101	0.094	0.341	0.428
PBLT2_RAdj	0.058	-0.246	0.227	0.191	-0.042	0.019	-0.077	0.061	0.082	-0.161	0.044	0.034	0.766	0.217	0.163	-0.040	0.040	0.115	0.231
PBLT4_RAdj	0.029	-0.236	0.261	0.309	0.012	0.030	-0.052	-0.016	0.048	-0.138	-0.066	0.172	0.759	0.302	0.144	0.031	0.068	0.151	0.256
PBLT5_RAdj	0.211	-0.287	0.247	0.303	-0.004	0.073	-0.012	0.014	0.158	-0.220	0.212	0.178	0.810	0.340	0.316	0.198	0.209	-0.046	0.164
PBLU1	0.291	-0.009	0.416	0.512	-0.046	-0.064	-0.111	0.123	0.230	0.003	0.161	0.416	0.569	0.825	0.233	0.133	0.097	0.140	0.475
PBLU2	0.454	-0.005	0.542	0.599	0.111	0.063	0.052	0.210	0.291	0.227	0.401	0.367	0.399	0.909	0.388	0.202	-0.016	0.113	0.458
PBLU3	0.388	0.064	0.544	0.540	0.115	0.132	0.099	0.183	0.276	0.110	0.358	0.419	0.448	0.924	0.378	0.161	-0.026	0.293	0.511
PBLU4	0.378	-0.066	0.491	0.557	0.057	0.113	0.083	0.265	0.293	0.133	0.367	0.374	0.424	0.914	0.456	0.227	-0.021	0.217	0.563
PBLU5	0.327	0.071	0.456	0.488	0.022	0.013	-0.037	0.217	0.207	-0.022	0.290	0.418	0.492	0.883	0.427	0.227	-0.076	0.267	0.565
PSL1	0.539	-0.280	0.297	0.434	0.076	0.033	-0.048	0.302	0.485	0.044	0.481	0.102	0.283	0.393	0.658	0.383	0.203	0.052	0.258
PSL2	0.516	-0.167	0.174	0.248	0.103	0.057	0.040	0.298	0.387	0.120	0.452	0.031	0.247	0.357	0.755	0.248	0.122	0.013	0.332
PSL3	0.252	-0.063	0.131	0.101	0.098	0.090	0.016	0.546	0.146	0.100	0.205	-0.091	0.248	0.332	0.799	0.103	-0.083	0.305	0.581
PSL4	0.362	-0.224	0.013	0.117	0.141	0.182	0.102	0.242	0.315	-0.001	0.379	0.002	0.250	0.283	0.831	0.197	0.086	0.047	0.333
PSL5	0.396	-0.133	-0.107	0.065	0.035	0.087	0.152	0.274	0.402	0.092	0.404	-0.122	0.098	0.205	0.715	0.142	0.199	-0.002	0.215
SFGS1	0.471	-0.203	0.151	0.378	0.147	0.118	0.026	0.184	0.373	0.045	0.413	0.242	0.156	0.327	0.360	0.758	0.226	-0.042	0.041
SFGS2	0.525	-0.151	0.177	0.345	0.068	0.042	-0.027	0.249	0.383	0.168	0.459	0.203	0.148	0.277	0.341	0.814	0.265	-0.019	0.070
SFGS5	0.159	-0.186	0.052	0.037	-0.021	0.054	0.044	0.169	0.120	-0.107	0.140	-0.044	0.031	-0.019	0.091	0.594	0.162	-0.052	-0.054
SFGS6	0.208	-0.159	0.118	0.097	0.187	0.234	0.039	0.263	0.130	-0.036	0.245	0.043	0.065	0.112	0.100	0.820	0.204	0.013	0.002
SFGS7	0.203	-0.081	0.067	0.036	0.216	0.192	0.099	0.187	0.120	0.088	0.170	0.071	0.014	0.075	0.097	0.805	0.326	0.003	0.027
SFNS6	0.187	-0.036	-0.103	0.009	0.061	0.082	0.061	0.126	0.112	0.035	0.111	-0.011	0.119	-0.045	0.128	0.300	0.967	-0.140	-0.142

SFNS7	0.164	0.009	-0.068	0.075	0.052	0.136	0.121	0.158	0.126	0.024	0.096	0.040	0.154	0.025	0.069	0.309	0.968	-0.059	-0.155
SIFI1	-0.008	0.100	0.248	0.143	0.018	0.068	-0.018	0.185	-0.075	-0.074	-0.025	0.029	0.272	0.205	0.196	-0.009	-0.089	0.923	0.467
SIFI2	-0.013	0.193	0.203	0.031	0.042	0.066	-0.002	0.227	-0.077	-0.002	-0.026	-0.039	0.182	0.184	0.077	0.009	-0.040	0.947	0.397
SIFI3	-0.059	0.179	0.195	0.016	0.039	0.089	0.002	0.183	-0.077	-0.051	-0.111	-0.009	0.143	0.257	0.162	-0.061	-0.153	0.922	0.505
SIPI2	0.268	-0.063	0.382	0.300	-0.131	-0.061	-0.094	0.319	0.149	0.101	0.146	0.047	0.369	0.559	0.515	0.040	-0.177	0.439	0.966
SIPI3	0.163	0.039	0.309	0.148	-0.151	-0.069	-0.086	0.288	0.083	0.071	0.057	0.035	0.299	0.504	0.441	-0.074	-0.185	0.490	0.947
SIPI4	0.277	-0.118	0.342	0.287	0.005	0.045	-0.006	0.293	0.149	0.003	0.170	0.080	0.404	0.562	0.462	0.119	-0.066	0.453	0.897

***The following three (3) items are removed due to cross-loading: ATC4, IFS3 and SIPI1.